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CONSTRUCTION AND EQUIPMENT

No. 3

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CIRCULATING CAPITAL ORGANIZATION AND USE IN CONSTRUCTION

Reserves Should Be At Suppliers

Moscow DEN'GI I KREDIT in Russian No 11, Nov 79 pp 44-47

[Article by Professor V. N. Dolzhnykh and Candidate of Economic Sciences V. A. Bezdelev]

[Text] The resolutions of the 25th CPSU Congress anticipated accelerating the rate of turnover of circulating capital in the national economy by 3-5 days and preventing the formation of excess reserves of materials and equipment.

Carrying out this task in capital construction necessitates improving the management of production reserves on cost-accounting principles and using the important economic tool of bank credit for these purposes.

What is the essence of production reserves management in construction? In the final analysis, management of reserves reduces to the optimization of reserves: they must be sufficient to ensure high rates of installation of projects under construction without freezing funds in reserves not needed at a particular time.

At the same time, practice bears out the fact that there have been instances of funds being frozen in production reserves. For example, in early 1978, there was 431.2 million rubles worth of residual basic construction materials, components and parts in contractor activity and residual raw, basic and auxiliary materials and finished output alone at reinforced concrete items plants and house-building combines of five construction main administrations: Glavkrasnoyarskstroy, Bratskgesstroy, Glavvostoksibstroy (Irkutsk), Glavdal'stroy (Khabarovsk) and Glavvladivostokstroy. Construction sites unquestionably had to have had carry-over reserves at the end of the year. It is a question of how much. In this instance, the price of these "residuals" might be more perceptible, but the problem of reducing them becomes more urgent if one understands that the value of these residuals equals the value of all the material resources required for the half-year program carried out by all five of the main administrations cited using their own efforts.

It must be recognized that a portion of these astonishing reserves, and that also means a certain sum of state funds frozen in them, testifies to an insufficiently high level of management.

On the other hand, in spite of these considerable reserves, over the course of a year one construction site or another stands idle due to interruptions in the supply of material resources. The problem of providing construction sites with materials and items is evidently associated with more than just the amount of production reserves and their volume in cost terms. No less important is the physical-substantive structure of these reserves. It is in fact clear that no amount of wall panels can be used at a construction site in place of a single girder.

In this connection, one condition for optimizing reserves is objectively advanced by the attainment of good coordination of the activity of contractor organizations and the activity of industrial enterprises which are part of construction main administrations, as well as by intensifying the planned nature of the activity of industrial enterprises providing construction sites with many materials and items (metal components, roofing and lining materials, paint, glass, and so on).

The manpower problem born of scientific and technical progress also arises here. On the one hand, the influence of scientific and technical progress unquestionably helps us overcome the seasonal nature of construction and correspondingly leads to a reduction in seasonal reserves, but on the other, the process of concentrating and specializing construction production is accelerated under its impact, which is expressed in the creation of large enterprises specialized to produce materials, construction components, parts and subassemblies. This leads to expansion of the circle of suppliers, to an increase in the time necessary to coordinate delivery schedules, to an increase in delivery distances, and it leads objectively to the necessity of some sort of preliminary accumulation of material resources before they are deliveried to construction sites in complete sets.

The problem of supplying complete sets of materials from outside suppliers is solved through a specially created unified state material-technical supply system. Also linked to this system is a system of production-technological set-provision operating within the construction main administrations. Production-technological set-provision trusts are being created or are already operating as part of the construction main administrations, as are production-technical set-provision administrations within the construction trusts. The primary purpose of such agencies is to act as links uniting the activity of contractor organizations with that of the industrial enterprises within the same main administration.

Until it is used at projects being put up by subcontractors, the output of industrial enterprises is in the form of production reserves. From the viewpoint of national-economic effectiveness, it is very important that production reserves reach the consumer as quickly as possible. Of great importance at this level is the problem of where these reserves should be, at the supplier or at the customer.

There is thus far no unity of opinion among specialists involved with managing production reserves on this question. Some take the view that reserves must be concentrated at the customer, inasmuch as commodity stocks at the supplier are then reduced and additional warehouse space is no longer needed, thus saving capital investments on creating such facilities. And the customer gains an opportunity to increase resources so as to increase production volume.[1]

But there is another position which, in our view, defines the place of production reserves most accurately. In particular, those holding this position think that calculations for complete-set deliveries necessitate that suppliers have additional circulating capital, while stocks of paid-for material values at contractor organizations decrease, thus freeing a portion of their circulating capital which can then be transferred to organizations supplying complete sets or to supplier plants without harm to the contractor organization.[2]

We share this viewpoint and suggest that a departure from this requirement leads to the creation, on the one hand, of large production reserves and, on the other, to the artificial generation of materials shortages.

Thus, as applicable to capital construction, the most justified position seems to be that in accordance with which reserves must basically be concentrated at the supplier, that is, at industrial enterprises. Supplier reserves actually acquire incomparably greater mobility than is possible when they are concentrated at the customer. At any given moment, reserves concentrated at the supplier can be sent to the precise project at which the precise items are most needed. If reserves are scattered around the construction sites, surpluses of particular items and materials at some sites and shortages at others will be unavoidable. The transfer of particular production reserves from one project to another, even within a single main administration, is accompanied by losses of time and by additional outlays.

Analysis of production reserves and their distribution across industrial and contractor activity in the five above-named construction main administrations reveals a clear trend towards concentrating production reserves at the contractor. With what is such a concentration of production reserves in contractor organizations associated?

The large contractor activity reserves of the Glavvostoksibstroy are being explained, for example, as being due to "bringing in considerable amounts of parts and components, and especially prefabricated reinforced concrete, to individual construction sites; as a result of unprepared work fronts and the arrival of parts in violation of technological sequentiality, the parts

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1. PLANOVOYE KHOZYAYSTVO No 5, 1975, p 141.

2. N. D. Fasolyak, "Upravleniye proizvodstvennymi zapasami" [Managing Production Reserves], Moscow, Izd'vo Ekonomika, 1972, p 234; L. I. Mazurin, "Progressivnyye raschety v stroitel'stve" [Progressive Calculations in Construction], Moscow, Izd'vo Finansy, 1975, p 101.

cannot be used immediately, resulting in the creation of considerable reserves."

However, in our view, this explanation does not reveal the reasons why production reserves are concentrated in contractor organizations. Orientation towards the indicator of output sales exerts a substantial influence on the settling of production reserves in contractor activity.

In the race for a high level of output sold, industrial enterprises fairly often ship construction sites their items in incomplete sets and supply them not with what they need today, but things they can do without for several more months. When this is done, the delivery sequence dictated by the technology of the construction process is violated. This also occurs frequently due not to the fault of industrial enterprises, but due to malfunctioning of the system of coordinating the activity of all links in the construction conveyor.

In this connection, the complex of measures to increase management efficiency which was outlined by the CPSU Central Committee and USSR Council of Ministers Decree "On Improving Planning and Strengthening the Influence of the Economic Mechanism on Improving Production Efficiency and Work Quality" has taken on special urgency.

The creation of a definite economic mechanism which can be used to subordinate the interests of suppliers and consumers of building materials, parts and components to the interests of carrying out the state capital construction plan is an important means for solving the problem of coordinating the activity of industrial enterprises with that of contractor organizations.

Scientifically developed own circulating capital normatives must become a necessary link in such a mechanism.

The objective necessity of optimizing own circulating capital normatives in industry and their scientific substantiation open up the possibility of extensively developing production-technological set-provision, which has a number of advantages. Thus, a special order is issued each year for the Glavkrasnoyarskstroy on the procedure for planning the demand for and organizing deliveries of prefabricated reinforced concrete items and basic building materials. On the basis of that order, the Tyazhstroykomplekt trust works out an annual plan for delivering material resources for the Glavkrasnoyarskstroy's entire construction and installation work program. Such a plan is a means of centralized, flexible management of production processes based on technical parameters, worked out in advance, which reflect the demands of scientific and technical progress (with consideration of the growing industrialization and availability of machinery in construction work, the introduction of flow-line methods, and the specialization of construction organizations).

An annual delivery plan (broken down by quarter) is determined for each project on the basis of lists compiled by construction trust production-

technological set-provision administrations (UPTK). After approval by the leader of the main administration, it becomes binding on all construction participants. That signifies that the activity of both the industrial enterprises and the contractor organizations is coordinated in the plan. The delivery plans drawn up in a quarterly cross-section are detailed by month, and their highest degree of concretization is reached in the weekly and daily schedules.

The set-provision system used in the Glavkrasnoyarskstroy has proven effective. Nonetheless, the problem of optimizing production reserves in construction is quite broad and multileveled. Solving problems of production stocks norms for building different facilities and production capacities of industrial enterprises within the construction ministry system, of creating an effective system of material-technical supply for construction sites and organizing warehousing on a scientific-technical level, of creating scientifically substantiated own circulating capital normatives, and of strengthening state supervision of the creation and movement of material resources in construction on the part of the USSR Gosbank, Stroybank, Gossnab and finance organs, is an important component of this problem. And of course there are also other aspects of it.

Above, we touched on the question of own circulating capital normatives. Many years of observation of the activity of construction organizations bears out the fact that many industrial enterprises of the construction main administrations are experiencing financial difficulties associated with the freezing of commodity-material values in inactive production reserves scattered among project warehouses.

But in such situations the main administrations get an increase in the own circulating capital normative in contractor activity. Thus, the normatives "trail submissively behind" increasing reserves of commodity-material values. Things would apparently change were the bulk of the production reserves in contractor activity to be provided through credit financial resources. In granting credit, the bank has an opportunity to control construction site financial-economic activity through the ruble.

At the same time, we have already noted the necessity of increasing the own circulating capital normative in industrial activity. This is associated with the introduction of delivery in complete sets, and such an increase could be effected in certain measure by shifting existing normatives from contractor activity to industrial activity. This would enable us to ensure a normal course of production-technological set-provision; moreover, it would help industrial enterprises out of the financial difficulties they experience due to the shortcomings of the production reserves normative. In this regard, contractor organizations gain an opportunity first to do with less reserves and second to use credit more extensively.

When they apply for credit, contractor organizations place their production activity under strict bank control. It is widely known that credit does not

mechanically make up a shortage of circulating capital, but is granted on the basis of statutory principles of planning, payment, term, repayment and coverage.

Under conditions of the increased normative being examined here for industrial enterprises, the latter also have an opportunity to make extensive use of bank credit during temporary financial difficulties, but not during chronic ones, as is the case now.

Thus, by shifting a certain portion of the normative for creating production reserves from contractor activity to industrial activity, the possibility opens up of strengthening the financial support of contractor and industrial subdivisions of construction main administrations on the part of the banks and of strengthening state bank control over the course of capital construction.

Accelerating Capital Turnover in Tadzhikistan

Moscow DEN'GI I KREDIT in Russian No 11, Nov 79 pp 47-48

[Article by A. I. Yeliseyev, capital investment financing administration deputy chief in the Tadzhik Republic Office of the Gosbank]

[Text] Analysis of the amount, distribution and use of circulating capital by contractor organizations of the Tadzhik SSR Ministry of Reclamation and Water Management during the Ninth Five-Year Plan and the initial years of the 10th shows that their amount increased nearly 2.5-fold. During that period, great changes also occurred in the distribution of circulating capital: whereas circulating production capital increased more than threefold, cash and disposable stocks increased only 1.5-fold. The rates of growth of circulating production capital were nearly two-fold higher than the rates of growth of cash and disposable stocks for contractor organizations.

The transfer of construction organizations to progressive forms of calculation has had a basic influence on increasing the circulating capital of contractor organizations, including circulating production capital. In this connection, there have also been substantial structural changes in the composition of circulating production capital. In particular, the proportion of unfinished production has increased.

Thus, one of the basic reserves for accelerating circulating capital turnover rate in these organizations is the bringing up of capital during the production process, as well as of production reserves, to the minimum necessary by accelerating the release of completed facilities and stages to the customer and by reducing the length of the construction production cycle.

Selection of an economically efficient structure of circulating capital sources influences accelerating the rate of turnover of circulating capital. For the organizations under consideration over the indicated period, its

dynamics testify that the proportion of own circulating capital in the structure of contractor organization sources has been substantially reduced and that the importance of loans has increased.

On the whole, structural shifts in sources, as in the circulating capital structure, are to be explained (as has already been pointed out) by the increasingly extensive introduction of progressive calculations for completely or partially finished construction production output, as well as by the involvement of customer capital as resources for financing expenditures on the incomplete production of construction-installation work.

However, the use of customer capital as advances hampers the expansion of operations based on short-term credit in construction and consequently also hinders strengthening the influence of credit on the economic activity of contractor construction-installation organizations.

At the same time, it should also be noted that the existing practice of granting credit to contractor organizations does not fully meet modern requirements and does not facilitate accelerating the start-up of projects. Thus, when calculating the amount of credit required for expenditures on unfinished construction and installation work, the base carry-over unfinished production transferred to the year being planned is adopted without full adjustment for unfinished production for projects not included in the plan, not provided with estimate-planning document, discontinued construction, and so on.

It is appropriate to focus attention as well on the following. The activity of contractor organizations depends on many outside factors which have a direct negative influence on normal activity and which consequently often generate above-plan unfinished production in contractor organizations. Thus, over a number of years, the labor, material and monetary resources of contractor organizations are diverted from planned projects to carry out such top-priority measures as eliminating the effects of natural disasters and increasing the water supply (such measures comprise approximately 10-15 percent of the amount of work done in an annual program). Such work frequently affects planned project start-up schedules.

Poorly compiled estimate planning documentation also affects the scheduled release of stages and projects. In order to curtail violations entailing disruptions of work production schedules and violations of contract terms by clients, suppliers and planning institutes, it would be appropriate to transfer the use of fines to Gosbank institutions, and in accordance with this, agreements on performing work, rendering services and making deliveries should be concluded trilaterally, with the participation of bank institutions doing the financing.

Expanding the sphere of bank control and granting credit for the actual amount of unfinished construction and installation work permit more effective ruble control of the economic-financial activity of contractor organizations and over cash and disposable stocks. This must facilitate reducing

the diversion of circulating capital to indebtedness and, in so doing, must facilitate accelerating the rate of turnover of circulating capital.

Setting Circulating Capital Norms

Moscow DEN'GI I KREDIT in Russian No 11, Nov 79 pp 48-49

[Article by K. K. Rozykul'yyev, manager of the Chardzhouskaya Oblast Office of the Stroybank]

[Text] Analysis of the volume and structure of the circulating capital of contractor organizations testifies to substantial changes in them. This is manifested, first of all, in an increase in the proportion of circulating capital and a reduction in the proportion of cash and disposable stocks. Thus, during 1977-1978, circulating capital in 29 oblast contractor organizations increased from 81 to 86 percent, and cash and disposable stocks decreased correspondingly to 14 percent. In this regard, the increase in the proportion of circulating capital invested in unfinished production characteristically occurred at the expense of a reduction in the proportion of such elements as goods shipped and services rendered, monetary means, accounts receivable and other circulating capital.

The basic cause of these changes is improvement in the system of calculations for construction and installation work done, the changeover to calculations for finished projects, large work stages and start-up complexes, which sharply increases the intervals between calculations between client and contractor. As a result, the amount of unfinished production on the contractor organization balance requiring additional capital to cover it increases. Thus, the amount of circulating capital for expenditures on unfinished production depends directly on the duration of the construction of a project, individual stage or start-up complex.

The analysis revealed that these organizations have been allotted circulating capital in minimal amounts inadequate for uninterrupted work, the prompt start-up of fixed assets and production capacities, or making calculations with clients and suppliers within the established schedules.

The question therefore arises of setting proper circulating capital norms. In developing scientifically substantiated circulating capital normatives, we need to consider first of all the large changes which have occurred and which are occurring in the economy: change in the procedure for planning capital construction, providing construction with estimate planning documentation, improving calculations between contractor organizations and clients, major shifts in the construction management system, and so on.

Stroybank economists, jointly with contractor organization specialists, have analyzed the sources of circulating capital for construction-installation administrations, mobile mechanized columns, construction and installation administrations and other primary subdivisions. It was revealed in this regard that the proportion of individual sources of circulating capital

does not remain stable, but changes along with growth in the scale of construction and the rise in its technical, with the increased profitability of contractor organizations, and with improvement in the forms of construction calculation and of all economic work.

Among contractor organization circulating capital sources, own and equivalent capital has tended to decrease and bank loans have tended to increase.

Contractor organization expenditures on unfinished construction and installation work in the period analyzed were covered by capital transferred by clients for temporary use (in the form of advances) and by bank credit. However, this system of organizing circulating capital made the contractor organization always dependent on the financial status of the client. Therefore, the abrogation of advances and change-over to the extensive use of bank credit as a source of contractor organization circulating capital and expansion of the sphere of Stroybank institution control of the activity of contractor organizations must facilitate improving the economic-financial activity of contractor organizations and improving the effectiveness of capital investments.

Calculating Unfinished Construction Volume

Moscow DEN'GI I KREDIT in Russian No 11, Nov 79 pp 49-50

[Article by Candidate of Economic Sciences A. M. Orlov]

[Text] One essential factor in solving the problem of financing unfinished construction production is the development of a method of setting norms for these expenditures as an economically expedient and technologically necessary stockpile. It would seem that, given such a method, problems of financing unfinished construction production could also be solved from a new standpoint.

Unfinished construction production is a dynamic indicator. The amount of unfinished construction production reaches a maximum before the project is released to the client, decreases to a minimum after payment, and then, as the contractor organization does the construction-installation work, again gradually increases to a maximum, and so forth. Consequently, the amount of unfinished construction production takes on two opposite values simultaneously, a maximum and a minimum, at the instant facilities and stages are released to clients.

Inasmuch as the process described results from objective features of the technology and organization of construction production, in practical planning, rate-setting, analysis and the financing of these expenditures we must delineate a minimum, maximum and average (annual) volume of unfinished construction production and a normative volume on any specific date, as well as the actual and planned levels. This feature of this particular indicator creates an opportunity for monitoring the correctness of the volumes being created and also, given an appropriate finance-credit mechanism

for meeting these expenditures, permits exerting a positive influence on the entire course of the construction.

Research shown that the average annual normative volume of unfinished construction production can be calculated adequately precisely in a majority of instances as a product of the volume of construction and installation work being done by a contractor organization on average for the month times the average normative amount of construction lag for projects and facilities being put up calculated with consideration of inventory normatives and construction duration norms.

The average annual planned (actual) amount of unfinished construction production is defined as 1/12th of the total carry-over expenditures at the start of each month of the planning (analysis) year plus 1/24th of the annual volume of contractor organization work.

Given known average annual normative and planned volumes of unfinished construction production, normative expenditures at the start of the planning year can also be determined rather simply. Research has shown that the amount of such expenditures will equal the total actual (anticipated) amount of unfinished construction production at the start of the year and its normative average annual amount minus the average annual amount of expenditures being planned. Knowing the value of the normative at the start of the year and given a known plan for releasing finished projects and stages to clients, as well as a planned amount of construction and installation work, one can determine as well the normative volume of unfinished construction production at any specific date in the calendar period using known methods. If that date coincides with the release of projects to clients (generally at the end of the month or quarter), the maximum amount of unfinished construction production created prior to that release will be more than the amount of expenditures obtained by known methods by the estimated cost of the facilities being released during that period.

The method presented for calculating normative and planned (actual) volumes of unfinished construction production was experimentally checked and has been widely used in the Belorussian SSR Ministry of Industrial Construction since 1976. It has been working under the new conditions of financial-economic interrelationships in construction. Beginning in 1978, experimental introduction of the indicated methods has been begun in a number of organizations of the Glavleningradstroy [Main Administration for Housing, Civil Engineering and Industrial Construction of the Leningrad Gorispolkom] as well.

Substantiation of the objective limits of fluctuation in contractor organization expenditures on unfinished construction and installation permits a slight restructuring of the system for organizing circulating capital for this type of expenditures, as well as solving a number of problems of economic incentives for reducing them.

The amounts of unfinished construction production within the normative seem to be economically justified and the monetary resources to cover them must

be offerred on the usual terms. But a higher interest rate must be charged for the use of above-normative amounts of monetary resources (generally bank loans).

The CPSU Central Committee and USSR Council of Ministers Decree "On Improving Planning and Strengthening the Influence of the Economic Mechanism on Improving Production Efficiency and Work Quality" anticipates setting a normative of 10 percent of the annual work volume done by construction-installation organizations through their own efforts to cover expenditures on unfinished construction-installation production during the period between credit regulation terms. The normative is met through own capital or through bank credit if own capital is lacking.

Under the new conditions, clients will cease to issue advances, and client funds freed in connection with the changeover to calculations without intermediate payments will accumulate in the bank and be credited to expenditures on unfinished construction and installation production.

Faulty Estimate Planning Documentation

Moscow DEN'GI I KREDIT in Russian No 11, Nov 79 pp 50-51

[Article by U. O. Baybatyrev, department head in the Checheno-Ingushskaya Republic Gosbank Office]

[Text] It is generally known that development of the construction economy depends largely on planning resolutions, since the durability and quality of projects, the cost and duration of their construction, and consequently the time needed to recompense production expenditures depend on the quality of the estimate-planning documentation produced, on its timeliness and completeness. Unfortunately, in practice, planning organizations often issue clients estimate planning documentation prepared without proper technical supervision, and clients often accept it. And expert opinion is often sought in a formalistic manner. The lack of proper supervision on the part of clients creates conditions under which documentation containing the following can be issued: ineffective planning resolutions adopted without comparing variants, documentation with more expensive materials and components sometimes inaccessible to builders, instead of locally accessible materials and components, inflated planning-survey work costs, errors in arithmetic, failure of the architectural-construction portion of the plan to conform to blueprints, and so forth.

It was due to just such shortcomings that excesses in estimate planning documentation were established by the engineering-monitoring apparatus of the Gosbank and Stroybank system. Here are several examples. The estimated cost of building the production-dispatcher communications system of the Alkhan-Churtovskaya watering and irrigation system was to be 486,000 rubles according to technical documentation worked out by the Checheno-Ingushskiy planning affiliate of the "Sevkavgiprovodkhoz." A check of this documentation established that the cost had been inflated by 201,000 rubles, or 41.3

percent of the estimated cost. A check of documentation for construction of a mineral fertilizers warehouse on "Gvardeyskiy" sovkhoz in Nadterechnyy Rayon established that costs had been overstated by 34,000 rubles, 9.4 percent of the estimated cost of the facility.

A check of documentation drawn up by the "Grozgiprosel'khozstroy" institute revealed overstated costs for a number of other projects.

The above-indicated and other cases do not bring honor to planning organizations, and the defects they permit lead to a situation in which scheduled openings of construction financing are delayed, work is periodically stopped at construction sites, calculations between clients and contractors are not made at the proper times, the estimated cost of projects is unjustifiably increased, and all this taken together unquestionably influences the prompt start-up of facilities and projects.

Of course, in many instances, estimate planning documentation is adjusted in accordance with decisions made by the Gosbank technical department prior to payment for the facility, but the Gosbank engineering service does not manage to check the documentation for all projects being financed, and even then, clients and planning organizations do not always accept the suggestions, so it becomes necessary to make changes during the construction itself. Therefore, it would be to the point to recall the words of Comrade L. I. Brezhnev, General Secretary of the CPSU Central Committee and Chairman of the USSR Supreme Soviet Presidium, to electors of the Baumanskiy Rayon of Moscow: "Resolution of the economic tasks facing us will require a creative approach, high responsibility and the strictest discipline in all links of the economy. Let each person operating a machine, working in the fields or drawing blueprints ask himself if he has done everything he can to work more productively, with better quality, to save materials...." This applies directly to planning organization workers, client departments, contractor organizations and other economic agencies, to everyone participating in creating fixed assets, the basis of our country's economic potential.

Only the harmonious interaction of all links participating in the construction process and the active stance of bank financing institutions will enable us to achieve the primary aim of capital investment, the prompt start-up of production capacities and facilities.

Implementation of the complex of measures outlined by the CPSU Central Committee and USSR Council of Ministers Decree "On Improving Planning and Strengthening the Influence of the Economic Mechanism on Increasing Production Efficiency and Improving Work Quality," including the broader development of credit relations, will facilitate further accelerating and improving planning and construction. Thus, it anticipates that planning organization expenditures prior to the planned release of projects will be covered by own circulating capital and bank credit. When the planned period for releasing projects has expired, credit is extended at a higher percentage rate for the use of loans. This must also be facilitated by the planned improvement in calculations.

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CONFERENCE HELD TO DISCUSS TRENDS IN CONSTRUCTION TECHNOLOGY

Moscow MEKHANIZATSIYA STROITEL'STVA in Russian No 1, 1980 pp 2-4

[Article by V. M. Meshkov, engineer and special correspondent to MEKHANIZATSKIYA STROITEL'STVA: 'Improving Organization and Technology in the Construction Industry;" based on materials from an all-union conference held in Staryy Oskol]

[Text] On 27-29 September 1979, an all-union conference was held on the theme, "Basic Directions of Technical Progress in the Organization and Technology of the Construction Industry," that was organized by the Central and Belgorodskaya Oblast boards of the Scientific-Technical Societies or the Construction Industry, USSR Gostroy, the USSR Ministry of Construction and the Belgorodskiy obkom of the CPSU in Staryy Oskol where the largest electrometallurgical combine in Europe is under construction.

The Central Committee of the professional union of workers in the construction industry and the industry for building materials, the USSR Ministry of Construction, the USSR Ministry for Industrial Construction, the USSR Ministry for Assembly and Specialized Construction, the Ministry for Agricultural Construction, the Central Scientific-Research and Experimental Design Institute for the Organization, Mechanization and Technical Aid to Construction under USSR Gosstroy, the Staryy Oskol CPSU gorkom, the "Elektrometallurgstroy" combine, the "Orgatroy" trust of the USSR Ministry of Heavy Construction and other organizations took part in the proceedings of the conference.

More than two hundred delegates from the nation's construction ministries and officies and about sixty delegates from construction organizations in the Belgorodskaya oblast took part in the conference.

A number of reports explaining the results of efforts undertaken by industrial, scientific-research and design subdivisions and institutions for higher education in regard to the theory and practice of the organization, mechanization and technology of production in construction-assembly and special operations were presented at the conference and the basic directions of their development for the future were defined.

Four sections operated during the conference: "Organization and Administration of the Construction Industry," "Technology of the Construction Industry," "Technology of Assembly and Special Construction Operations" and "Mechanization of Construction-Assembly Operations" and a topical exhibit was set up. Several interesting excursions were also made to projects under construction at the "Elektrometallurgstroy" combine and the "Orgtekstroy" trust.

V.M. Il'in, second secretary of the Belgorodskiy CPSU obkom delivered the opening remarks.

I. A. Ganichev, vice-chairman of USSR Gosstroy who familiarized the participants in the conference with the problems facing builders during the 11th Five-Year Plan opened the conference and explained the basic trends in technical progress in the organization and technology of the construction industry.

It was noted that the number of workers involved in performing operations in construction by hand has declined by 18 percent during the period 1970-1978. The conveyor-block assembly of structural surfaces in industrial buildings and large-block assembly of technological equipment and pipelines have undergone extensive development.

A great deal of attention was focused on providing the construction industry with the resources of mechanization. At present, more than 600,000 basic construction machines are being used in contract work alone. Construction's level of mechanized equipment had reached 17.7 percent by the beginning of the current five year plan.

A number of construction organizations are undertaking the model construction of major projects based on comprehensive programs of organizational-technological support ("Staryy Oskol," "Ul'yanovsk," "Riga") in cooperation with the scientific-research institutes of USSR Gosstroy.

At the same time, technical progress in the organization of the construction industry, technology and the mechanization of construction-assembly operations, the scales for introducing progressive methods and the level of their effect on the efficiency of construction do not insure the necessary level of improvements in the technical and economic indicators for the work of construction organizations, for shortening the time of construction, reducing its cost or increasing the productivity of the labor of builders.

Over the past few years, the rates of growth in the efficiency of the work of construction organizations has slacked off. The increase in the productivity of the labor of employees has slowed, the volume of unfinished construction has increased, utilization of the active portion of primary funds is improving slowly and the actual time involved in the construction of numerous projects is considerably exceeding the norm. A low degree of interchangeability in the work of construction organizations restrains the rate of improvement in the use of the existing inventory of mechanized equipment. The idle time of machinery during shifts is great.

The slow improvement in technical-economic indices in construction is brought about primarily by shortcomings in the planning and organization of the construction industry, by the fragmenting of labor and material-technical resources among numerous projects under construction at the same time, by a lack of technological adaptability in design resolutions, by low quality in building materials and structural parts and later or incomplete delivery of technological equipment subject to assembly.

The efforts of scientific-research and design organizations have not centered enough concentration on the current, more pressing topics which can have a substantive effect on improving the technical-economic indices of construction; the percentage of theoretical developments that can be used to work out specific measures is small; progressive experience has not had adequate study or generalization; few production experiments have been run to verify the effectiveness of new developments and theoretically sound proposals in practice.

Consistent with the resolution of the CC CPSU and the USSR Council of Ministers to improve the planning process and strengthen the effect of the economic mechanism on improving the efficiency of production and quality of operations, a radical restructuring of the planning process and economic stimulation of the construction industry is at hand.

The objective is to increase the level of planning and economic organization, to bring them into line with the needs of the current stage which is an era of developed socialism and to achieve a significant increase in the efficiency of the construction industry, acceleration in scientific-technical progress, an increase in the productivity of labor and improvement in the quality of the construction product.

B. Ya Riskind, deputy chief of the ministry's main technical administration delivered a report, "Basic Trends for Elevating the Technical Level of Construction in the USSR Ministry for Heavy Construction." According to the ministry, during 1978, a relatively high level of industrial construction was achieved. The specific share of totally prefabricated construction was 74.1 percent and construction of large-panel and fully unitized residential housing amounted to 69.3 percent. The increase in the level of fabricaion in major projects is developing along several different lines which include the operations of the "zero-level" cycle as well as above-ground work.

In addition, the reserves within the construction industry are also quite sizeable. When the level of the leaders has been attained by all organizations, the number of employees in the basic types of construction and installation operations can be reduced by 37,000 persons. The first-priority goal is to reach a base-line level for the basic types of operations as established by the ministries which will make it possible to reduce personnel by 14-14.5 thousand employees.

In order to insure the fulfillment of goals to increase the productivity of labor, builders must elevate the basic output per employee during the next few years by a minimum factor of two in concrete, finishing and roofing work, for example.

Standard kits for assembly rigging, large-unit prefabrication of elements, conveyor-block assembly and progressive technology in welding operations should be widely introduced to increase the productivity of labor in installation work.

G. A. Sukal'skiy, deputy chief of the main technical administration of the USSR Ministry of Installation and Special Construction delivered a report on the topic, "Upgrading the Organization and Technology of Installation and Special Operations in Industrial Construction."

Within the ministry, for all practical purposes, there has been a complete refitting within the organizations involved in installation technology. The production of caterpillar assembly cranes with load capacities of up to 100 tons, pneumatic-tire and gantry cranes with capacities of up to 200 tons, hydraulic hoists with capacities of up to 400 tons, assembly towers with rigging to lift units weighing up to 1,000 tons as well as a large number of resources for low-level mechanization and tools has been organized at enterprises under the ministry.

One of the primary functions of the institutes of the USSR Ministry of Installation and Special Construction is an effort in conjunction with the machine building ministries to establish progressive technical conditions for the supply of technological equipment with a high level of factory readiness with an allowance made for the demands of industrial assembly. The introduction of these technical conditions has made it possible to shorten the time required for assembly of equipment by a factor of 1.5 to 2.

In compliance with the annual plans for developing and introducing new technology, the ministry's organizations are introducing the techniques of large-unit assembly of structures and equipment on a large scale while managing to cut back on high-altitude operations and shifting as many of operations as possible from construction sites to shops. The conveyor method of assembly which has been used to assemble more than 6,000,000 square meters of industrial structures has been given extensive development.

The introduction of the installation technique for technological equipment in unitized blocks whereby an aggregate is fully assembled at a machine-building plant and then delivered to a construction site and installed in its blue-print position has begun. This method of installation increases the productivity of labor several times over, greatly reduces the amount of time involved in the performance of operations and, because of the more compact configuration of equipment, also reduces the size and cost of a structure.

Efforts to organize the supplying of bridge cranes with electrical equipment installed right at the plant are underway in cooperation with the Ministry of Heavy Machinery. This will increase the productivity of labor and, as a result of the faster start-up of the cranes, will make it possible to use them in the installation of equipment. More than 700 such cranes were brought into projects under construction during 1978.

I. A. Mitrofanov, director of the Scientific-Research Institute for Construction Economics under USSR Gosstroy discussed the effectiveness of upgrading the organization of the construction industry's administration.

Consolidation and specialization of construction organizations along with improvement in the technical and economic indicators of their performance will create the prerequisites for introducing more progressive methods of organization and technology in construction, insuring a rhythmic nature in the completion of projects and improving maneuverability of material and labor resources. In addition, this is also conducive to a further division of labor within organizations, a reduction in the volume of external communications, the introduction of flow-line and other progressive techniques for the performance of operations, improving social conditions, insuring the stability of cadres, elevating their level of expertise and reducing the time required for the construction of projects.

In the modern setting, as practice has shown, the highest indices are achieved by organizations which have widely introduced the crew contract method. During 3 years of the 10th Five Year Plan, contract crews which make up 22 percent of the entire work force in construction have performed 28.7 of the total volume of operations.

One of the most progressive methods of organizing and administering the construction of major industrial enterprises is the unit method of planning the preparation, organization and administration of the construction process. Experience in introducing this method within the system of the Ukrainian SSR Ministry of Heavy Construction and some other construction ministries has proven the high level of savings from its use.

The reports "Technical Progress in Organizing Civilian Residential Construction," Organizational and Technological Support for the Large Industrial Complex," and Pressing Problems of Labor Protection in Construction" were also presented to the plenary session.

V. V. Semkovskiy, deputy chief of the department for the mechanization of construction of USSR Gosplan presented the report "The Development of Mechanization in Construction and Installation Operations--A Basic Trend in Increasing the Effectiveness of the Construction Industry" to the section "Mechanization of Construction and Installation Operations." This speaker noted that the average duration of machine operations per day has not increased according to accounting figures for 1978 and has remained at the level of 10-12 hours. There exists a great deal of above-standard idle time among machines for maintenance which results in the fact that the established goals for the production of a number of basic machines are not being fulfilled. Repair technology also has frequent idle time within shifts which reaches 18 to 20 percent as a result of less than perfect organization and planning in the conduct of construction and installation operations.

It is necessary to concentrate the inventory of machinery in the administrations and trusts for mechanizations, to share experience in planning for the work of construction cranes during the standardized time of their operation on a wider basis and to focus more attention on the organization and improvement of the work of tool distribution points.

Mechanized complexes (excavator-autotransport), bulldozer and scraper teams working by the crew contract method have become widely used in specialized trusts and administrations for the mechanization of earth-moving operations. Entire crews and teams of maintenance technicians have made the transition to the contract method operation and numerous tower crane operators have joined contract construction crews. However, these progressive methods have not as yet become the basic principle for the organization of labor.

V. M. Kazarinov, deputy director of the Central Scientific-Research and Experimental Design Institute for the Organization, Mechanization and Aid to Construction (TsNIIOMTP) reported on basic trends in scientific research in the field of mechanized equipment for construction.[1] This speaker discussed a system of machinery for the comprehensive mechanization of construction that was developed by TsNIIOMTP in cooperation with the leading branch construction-technological and machine building institutes during 1976-1990 and approved by USSR Gosplan and the Ministry of Construction for Road-Building Machinery in 1977.

Considerable development and innovation in the resources of mechanization is foreseen for this system. Consistent with the listing for unavailable resources of mechanization determined during the development of the machinery system, a number of studies have been made whose ultimate purpose is the development of technical requirements for the creation of new machinery.

Technical requirements have been worked out for auto-cement pumps, belt concrete placing machines, short-base tire-mounted cranes with capacities of 10 and 16 tons, single-bucket tire-mount loaders with capacities of 6 and 10 tons, a complex of machinery for the installation of roll roofing materials, plaster and painting installations and other.

Based on these base-line requirements, work has begun to develop and master serial production of these machines by a branch of construction and highway machine building. A system of specialized autotransport resources which has become a part of the system of machinery for the comprehensive mechanization of construction has been developed.

Within the area of comprehensive mechanization of loading-offloading and transport operations, one of the primary means for solving this problem is the extensive introduction of container and packaged shipments of heavy construction goods.

Forty standard sizes have become a part of the inventory of specialized containers and packaging resources that has been developed. At present, a large number of these have been tested and recommended for mass introduction in construction as standard items.

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1. MEKHANIZATSIYA STROITEL'STVA, 1979, No 9.

A "Statement on Specialized Subdivisions of Low-Level Mechanization" which defines the basic goals of the specialized subdivisions for low-level mechanization, their functions, organizational structure and relationship relative to construction organizations has been developed and presented for ratification by USSR Gosstroy.

A system of machinery for the comprehensive mechanization of construction will be in the developmental stage during 1981-1985 during which time the problems facing builders during the 11th Five-Year Plan will be given consideration. The development of machinery with broader technological capacities and increased operational qualities of fundamentally new technology for the purpose of mechanizing labor-intensive processes is foreseen.

The deputy director of the All-Union Scientific Research Institute for Construction and Road Machine Building, P. V. Pankrashkin discussed the activity of the institute to increase the operational qualities of machinery, including those for the conduct of operations in the regions of Siberia and the Far East and spent some time on the questions that concern improvement of the design of construction and road-building machinery intended for operation in cold-climate areas, elevating machine resources prior to initial capital repair, improving their ergonometric indicators, upgrading the supply of base machinery and accessory items in the implementation of

G. A. Zemlyakov, branch chief of a Scientific-Industrial Organization of the All-Union Scientific-Research and Structural Design Institute for Mechanized and Hand Tools, Vibrators and Finish Work Machines (VNIISMI) explained the basic requirements for the designs of contemporary structural finishing machinery and the directions of their improvement. He reported on new machines that have been developed and are in various stages of design in accord with the future plan for comprehensive mechanization of construction operations during 1976-1990.

A. Kh. Kasumov, an administrator of the "Mosoblstroytrans" trust discussed the organization of transport procedures in construction using specialized transport equipment, packaging and containerization.

Questions of improving the inventories of machinery for assembly operations and vertical transport[2] were also discussed in the section on the basis of materials presented by the All-Union Complex Transportation Institute, "Montazhstroymekhanizatsiya" and the All-Union Scientific-Research Institute for Industrial Steel Structures under the USSR Ministry for Installation and Special Construction; maintenance and repair of construction machinery based on materials presented by the Main Administration for Mechanization of Construction of the USSR Ministry of Construction and the Central Scientific-Research Institute for the Organization, Mechanization and Aid to Construction;

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2. MEKHANIZATSKIYA STROITEL'STVA, 1979, No 10.

basic trends in developing technology for construction in low temperature conditions based on materials from the Krasnoyarsk Branch of the All-Union Scientific Research Institute for Construction and Road-Building Machinery and the problems of using resources of low-level mechanization within the construction organizations of the USSR Ministry of the Power Industry.

Within the recommendations of the conference, it was noted that the development of an inventory of the resources of mechanization in construction based on a system of machines for comprehensive mechanization of construction, further concentration of basic construction machines in the trusts and administrations for mechanization with concentration of the resources for low-level mechanization in administrations and sectors for low-level mechanization, an increase in the machinery inventories of construction organizations in the share of machinery with large individual capacities, the development of hydraulic capacities in construction machinery and an increase in their mobility, a considerable increase in the supply of the resources of low-level mechanization to construction workers based on standard tool sets, further improvement in the system of technical equipment and maintenance in specialized sectors and concentrating capital repair in departmental and inter-departmental associations are necessary.

For the purpose of increasing the efficiency of construction production, insuring a further increase in the productivity of labor, reducing the time involved in construction and improving the quality of construction and installation operations, it is necessary for the construction ministries and departments to give their primary attention to the most effective directions of scientific-technical progress in the organization, technlogy and mechanization of construction of the following organizational and technological solutions and technical resources in the construction industry;

in the area of construction industry organization--continuous planning and long-term flow plans at projects and complexes, the unit method in industrial construction, a uniform system of training for the construction industry, administering the construction of major projects on the basis of line models, crew contracts based on the experience of the Vinnitsa builders of the Ukrainian Ministry of Industrial Construction, industrial and technological set-up, the use of the principles of the scientific organization of labor, supplying crews with high-quality tools and equipment, use of the log book and expeditionary method for construction in remote areas as well as floating groups;

in earth-moving operations--operational organization based on comprehensive crews to include transport personnel, the use of machinery with increased individual capacities, preferential use of scrapers and continuous-operation machinery;

in concrete and ferro-cememt operations--centralized production of concrete mixtures, effective methods of supplying and installing concrete mixtures using cement pumps and cement placing machinery, the use of a unified stock of reuseable forms (adjustable shape, adjustable size and others), the introduction of new types of forms (non-removeable, inflatable, thermo-active and the life);

in the installation of structural members--consolidation of pre-fabricated elements, the use of structural members which contain temporary and permanent fastenings (to include structures self-locking three-dimensional assemblies), complex structural-technological units, the conveyor method of fabrication and the unitized assembly of surfaces in industrial buildings;

in roofing operations, the use of more effective sets of mechanization equipment, in finish work--mobile plaster and paint facilities, centralized manufacture of paints, effective means and equipment for applying paints (high pressure equipment, electostatic field equipment, etc.);

in loading-offloading and transport operations--packaged and containerized shipments of building materials (especially small-piece and case-lot goods); expand the use of specialized autotransport facilities; employ universal single-bucket loaders and short-base the tire-mounted cranes in loading operations, mechanization of the loading process in warehouse management.

The conference called on the collectives of the construction organizations, enterprises of the construction industry, scientific-research and design organizations to move widely develop socialist competition to fulfill all the plan indicators of the current five year plan and the successful realization of the resolutions of the party and government aimed at accelerating scientific-technical progress in capital construction.

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INCREASED MECHANIZATION OF CONSTRUCTION WORK ENVISAGED

Moscow MEKHANIZATSIYA STROITEL'STVA in Russian No 1, Jan 80 pp 4-8

[Article by P. I. Moiseyev, chief of the USSR Gosstroy Division for Mechanizing Construction: "Concerning the Plan for Complex Mechanization and Automation of Construction and Assembly Work for 1980"]

[Text] Much attention is given to capital construction in the CPSU Central Committee and USSR Council of Ministers Decree "Concerning an Improvement in Planning and Increasing the Influence of the Economic Mechanism to Improve Production Efficiency and the Quality of Work." Measures are outlined for increasing the effectiveness of capital investments, improving construction management, consolidating economic calculations and for economic stimulation of the final results. Special attention is given to the key problem of increasing labor productivity.

The decisions made by the November (1979) Plenum of the CPSU Central Committee and the positions and conclusions set forth in the address by L. I. Brezhnev to the Plenum have become a mobilizing program of action for all Soviet people.

Under modern conditions where powerful economic and scientific-technical potential has been created in construction, the problem of increasing the performance of existing resources is acquiring decisive significance. Further increases in the effectiveness of capital construction are directly related to improvements in construction production and labor productivity and in the rational use of construction techniques, materials and labor resources.

Completing work through the use of modern machinery has become a basic mode of production and such labor-consuming work as earthwork, assembly work, loading and unloading are done, as a rule, by machinery.

Year in and year out equipment yards of construction organizations are growing and being filled by new types of machinery, the use of which ensures an improvement in labor production methods and labor productivity. Technological features are improving and the range of interchangeable equipment for workers is expanding. Hydraulic excavators

furnished to construction jobs are equipped with hydraulic hammers and grippers for laying out "foundation walls" and piles that are to be driven and special shovels for layout work and for working frozen ground.

Hydraulic cranes with telescoping booms and jibs and mechanized bearing support assemblies are being produced in large quantities. The speed with which tower cranes hoist loads during construction of multi-storied buildings is increasing. These cranes are equipped with built-in equipment for lifting crane operators and service personnel.

Essentially, the range of finishing machinery and mechanized tools for construction is expanding. Technological equipment and devices used for production in construction-assembly work are being improved.

As far as improving the degree to which construction jobs are equipped is concerned, it becomes especially important that all of this be used on a highly technical level accompanied by improved utilization of machinery and the quality of completed work and an acceleration of the rate of growth in labor productivity based on a broad application of scientific and technological achievements, the use of advanced technology for labor production and an improvement in production in accordance with those high requirements which the party has set forth for improving capital construction.

In 1980 contract construction organizations must complete a significantly larger volume of construction-assembly work which would ensure that production capacities and structures intended for housing and cultural-service use will be put into operation.

The volume of basic labor-consuming work during the new construction year will grow in comparison with preceding years:

Work	1978 (actual)	1980 (plan)	1980 as % of 1978
Earthwork, million M^3	13,344.0	14,296.0	107.1
Loading and Unloading, million tons:			
Non-metallic materials	1,008.0	1,121.0	111.2
Assembled structures, timber, metals	693.0	743.8	107.3
Cement	46.1	50.1	108.7
Concrete, million M^3	79.8	86.3	108.1
Plaster, million M^2	369.6	400.2	108.3
Painting, million M^2	914.1	973.4	106.5

The plan for the complex mechanization and automation of construction-assembly work for 1980, worked out in collaboration with construction ministries and approved by USSR Gosstroy, establishes the goals for

the construction ministries, the attainment of which will provide a decrease in labor consumption of more than 82,000 workers. To achieve this the realization of existing potentials for increasing the technical level of organizational work at construction jobs and utilizing construction techniques is necessary.

The plan's goals stipulate a substantial decrease in the use of manual labor for basic labor-consuming tasks and an increase in labor productivity for construction.

The plan for 1980 foresees a further decrease in the volume of work done manually by calculating one million rubles of construction-assembly work as a percentage of the volume of work in 1975. This decrease with the growth in the volume of work indicated above is envisioned on the following scale:

Work	Volume of manual labor for 1 million rubles of construction-assembly work		Planned Decrease in 1980 as % of 1975
	1975 (completed)	1980 (planned)	
Earthwork, M^3	1,360.2	981.7	27.8
Concrete, M^3	94.9	70.1	26.1
Plaster, M^2	2,316.4	1,686.3	27.2
Painting, M^2	4,850.2	3,664.1	24.5
Loading-Unloading, tons:			
Non-metallic materials	304.3	213.7	29.8
Assembled structures, timber, metals	217.0	144.7	33.3
Cement	108.6	75.2	30.8

However, there were increases in the volume of certain types of work done manually for several construction organizations during 1979. Thus, for the first half of 1979 at job sites of the USSR Ministry of Construction for the Petroleum and Gas Industry and the Ministry of Construction, the volume of manual loading of structures used in construction calculated for one million rubles of construction-assembly work increased in comparison with the same period of the preceding year. The volume of manually completed plaster work calculated for one million rubles of work increased during the first half of 1979 in comparison with the first half of 1978 at construction sites of the Ministry of Construction for the Transportation Industry and the Main Moscow Oblast Construction Administration.

To complete the tasks established for 1980 of reducing manual labor consumption requires that organizational and technical measures be carried out which would provide a further reduction in the use of manual labor for production work.

However, there continues to remain a high percentage of workers who do work manually for plastering, painting, waterproofing, facing and other jobs which are completed during the concluding stages of construction. This can be explained most of all by the lack of complete mechanization for these types of work.

An analysis shows that the basic reasons that foster the use of manual labor for construction are:

imperfections in design decisions that specify the use of constructed elements intended to be completed by manual means;

a low level of plant preparedness of structures used in construction;

disturbing the technological sequence for completing work and allowing flaws in the execution of construction operations and processes;

incompletely utilizing mechanized devices and not providing the required mechanized means in sufficient quantity and variety;

an insufficient volume of centrally prepared mortar, cement, tints, and materials which are to be used;

insufficient cooperation and specialization in production for certain types of work.

As can be seen, reductions in manual labor for construction encompass the activities of practically all participants in construction production--designers, technologists, mechanics and workers in the transportation industry.

The use of standard sets of minor mechanized devices in conformance with the make-up of crews and the construction job has a great effect in reducing manual labor consumption and increasing labor productivity at job sites. It is important that all crew members be trained in the use of standard sets of equipment and how to organize their work when utilizing them.

Using standard sets of equipment and observing the rational use of technology makes it possible to sharply increase crew production yet checks which were conducted show that crews are provided with standard sets of equipment no more than 30 percent of the time and this reaches 50 percent only for several construction central boards.

The effectiveness of using hand machines and minor mechanized devices is generally known. Nevertheless at construction jobs the required amount of attention is still not being given to the organization and work of tool distribution centers and to supplying workers with quality hand tools and mechanized tools; claims are not always made against suppliers of poor quality tools.

It should be noted that the existing system of distributing mechanized tools and finishing machines through territorial supply administration does not promote the acceleration of equipping construction workers with the necessary technology.

USSR Gossnab has approved a resolution, beginning with 1981, to provide resources for mechanized tools, finishing machines and other minor mechanized devices directly to construction organizations; construction organizations will receive them through the territorial supply administrations based on the various orders of the ministries.

Such a change in the distribution system for mechanized tools and finish machinery will make it possible for ministries to control the process of equipping job sites with standard sets of equipment and other effective means of mechanizing work. This demands that in 1980 supply services and main construction mechanization divisions determine the resources that are needed and their proper distribution among the construction organizations in the territorial supply administration divisions.

Much organizational and engineering work aimed at reducing manual labor consumption must be systematically conducted at each construction job and at each administration and trust with active participation by "Technical Construction Organization" trusts, their instructors and other engineering-technical workers. It is important that efforts to reduce manual labor consumption at construction sites be under the constant control of all engineering-technical workers.

Significant reductions in labor consumption for loading-unloading and transportation work including heavy manual labor may be derived as a result of further improvements in organizing the production requirements for materials and hardware at construction sites.

The use of new means of highly efficient hoisting-transporting technology is speeding up operations involving various transfers of cargo and is making them easier. However, even with the highest level of mechanization the existing system for preparing cargo to be transported requires large consumptions of manual labor. A broad use of containers and packages is fundamentally changing the system of delivering cargo to job sites; it is making it more streamlined and cheaper and is providing complete mechanization of loading and unloading operations at construction sites. Using containers and packages for construction cargo is one of the general trends in technological progress and improving labor productivity.

Containers and packages for cargo are still being utilized on a small scale among the construction ministries, however. In 1978 about 42 percent of the total volume of cargo which can be transported by such means was transported in containers and packages and on pallets.

In industrial, highway and cultural-service construction the volume of premixed concrete is growing from year to year. Among the organizations which were considered, 130 million cubic meters of concrete were premixed in 1970, 180 million cubic meters in 1975, about 190 million cubic meters in 1978, and of mortar for construction, 42, 48 and 50 million cubic meters, respectively.

However, the level of automation for mixing concrete and mortar in the construction organizations under consideration for 1978, including enterprises chosen as an independent industrial comparison, comprised 42.4 and 32.2 percent, respectively.

In recent years the level of automation for mixing concrete at enterprises in a number of ministries that were chosen for industrial comparison (stationary plants) lags behind the level of automation for mixing concrete at construction site installations.

Thus, for the USSR Ministry of Energy as a whole, the level of automation for preparing concrete mixtures in 1978 comprised 59 percent, yet at construction sites of the very same ministry it was 64.9 percent, for the USSR Ministry of Industrial Construction it was 35 and 39.2 percent respectively, for the USSR Ministry of Construction 45 and 55.8 percent, for the Ministry of Construction for the Transportation Industry 55 and 58.1 percent, and for the USSR Ministry of Heavy Construction, 33.5 and 41.4 percent.

Meanwhile, at Main Moscow Assembly and Special Construction enterprises of the very same Moscow municipal ispolkom almost 100 percent of the mixtures were prepared at automated installations. This testifies to the fact that it is necessary to give more attention to the problems involved in transferring existing installations to automated systems.

Sometimes automated installations are not put into operation for a long time due to the fact that construction ministries have little control over when they will be put into operation.

Thus, in the "Krasnodarkraysel'stroy" administration under the RSFSR Ministry of Agricultural Construction only 2 of the 15 existing automated concrete mixing installations and plants with automated systems are operating.

In "Voronezhoblsel'stroy" organizations under the RSFSR Ministry of Agricultural Construction the preparation of concrete mixtures and mortar at a number of sites was accomplished at independently standing mixers while adding proportions of aggregate cement and water by hand.

No more than half of the 78 CB-75 type automated installations and other installations with automated systems that were received in the last 5 years by the Uzbek SSR Ministry of Aquatic Management are operating.

In a number of construction organizations the lack of technical services that are engaged in adjusting, utilizing and repairing automated systems and concrete mixing installations, centers and plants leads to the

result that they are controlled manually and under the best circumstances are controlled from a distance. Only by taking this into consideration is it possible to explain the fact that in 1978 automation for preparing concrete mixtures reached only 42.4 percent as opposed to 46.4 percent (for those contract organizations under consideration) in the plan.

The following did not meet the goals established by the plan for automating the preparation of concrete mixtures: the USSR Ministry of Heavy Construction, the USSR Ministry of the Coal Industry, the USSR Ministry of Agricultural Construction, the Ministry of Construction for the Transportation Industry, RSFSR, Ukrainian SSR and other construction organizations.

Automated preparation of mixtures used in construction at job sites of the USSR Ministry of Agricultural Construction comprises only 11.1 percent and 15.2 percent for the Ministry of Construction for the Transportation Industry.

As inspections that were conducted by us show efforts to meet the plan's goals for automation are organized poorly at a number of construction ministries. Technical construction organizations, institutes and construction job workers are not included in these efforts. The lack of the necessary exactness promotes a slow increase in automation for preparing concrete and mortar in construction.

For 1980 an increase in automation for mixing concrete and mortar to 50.2 and 40.3 percent respectively is specified.

Calculations show that a transfer of all concrete mixing plants and industrial enterprise installations of construction ministries to automated systems will make it possible to free more than 20,000 workers.

A massive amount of construction for industrial and civil structures is being done at present by utilizing prefabricated reinforced concrete.

The growth in the production of prefabricated reinforced concrete in our country has made it possible to solve the problem of providing the population with housing at a rapid rate. Erecting housing and industrial buildings from prefabricated reinforced concrete remains one of the principal methods for our country's conditions.

In addition to this, in a number of cases it is economically expedient to use monolithic concrete in structures used in erecting buildings.

The volume of monolithic concrete use is growing at a rate of 4 to 5 percent per year. Erecting foundations on driven piles, barriers for preventing water seepage, foundation walls, industrial and administration building roofs that have high bearing capacities, and other items will increase.

Strict observance of technological regulations and standards for production work when organizing the crucial buildings above in order to utilize monolithic concrete, etc. ensures a sharp improvement in the quality of the erected structures and a rational use of materials.

During 1980 construction is being completed for the first phase of a plant in Tuymazy that will manufacture automated concrete pumps, automated concrete mixers and concrete transporting vehicles; their production will increase each year and in conjunction with this the technical capabilities of using monolithic concrete in industrial and civil construction are growing.

However, the rational use of modern concrete transporting machines demands serious technological and organizational preparations, an improvement in the technical level of supervising the work and training for engineering-technical personnel and operators that are engaged in this process. Only by fulfilling these conditions does utilization of the new incoming concrete transport machines ensure that advanced technological processes will be introduced into practice for construction production and that labor productivity will increase by utilizing them.

The plan approved for 1980 also specifies a further increase in the use of automated suction dredging machines, trench excavators and automated graders with automatically controlled operating attachments at construction sites and an increase in the volume of work done by more effective methods of mechanization. Thus, the volume of work done by scrapers must increase to 1478.5 million cubic meters as opposed to 1313.1 million cubic meters in 1978.

The level of mechanization for roofing work on the average according to planning organizations should increase to 44.8 percent in 1980 as opposed to 39.9 percent in 1978.

Technical progress presupposes not only fundamental changes in equipment for labor and not only the creation and use in construction of new machines and materials but also the introduction of organization for production and labor in such a manner that would ensure a better use of construction techniques.

The output of construction machinery is one of the indicators which characterizes the level of organization in construction production.

The plan's goals specify a further increase in the productivity of machinery based on improved usage. The average output based on all of the machinery found among the inventory of a typical equipment yard for planned sections of organizations will increase in 1980 in comparison with data for 1978 in the following manner: for excavating technology by 3 to 6 percent; for boom and tower cranes by 6 to 12 percent.

As the analysis which was conducted shows the use of machinery at construction sites is improving extremely slowly; the average daily duration of work for machinery over a stretch of several years essentially has not increased and remains at the level of 10 to 12 hours per day. A random time study of machinery shows that there is a large amount of idle time during work shifts which reaches 15 to 18 percent of the shift's time. All of this testifies to the existence of large potentials for improving the use of machinery at construction sites, the realization of which will ensure not only the fulfillment but the overfulfillment of the established plan for the output of construction machinery.

Last year our USSR Gosstroy colleagues reviewed in detail the problem of improving the use of basic construction machinery and motor vehicle transport and brought the attention of the ministries and departments to the necessity of carrying out complex measures for further perfecting the organization of construction production and the use of machinery and for broadly applying the knowledge related to rational management which has been verified in practice.

The positive experience gained by the "Uralstroymekhanizatsiya" trust in arranging jobs into three shifts, which ensured high output for machinery and labor productivity under severe northern conditions, has not been put to use everywhere; for example, the staff of equipment operators at Kamgesenergostroy who have organized a system for massive uninterrupted successive shifts for completing earthwork and the complex qualitative implementation of it during construction of the Kamskoye motor vehicle plant as well as the progressive knowledge of other staffs of equipment operators in organizing the production of mechanized work.

Knowledge which has been acquired working and transporting soil by composite crews of excavator operators and dump truck drivers which can provide an increase in the output of these machines by 20 to 25 percent has not been introduced on a sufficient level at construction sites.

Utilizing successive crews on a broad scale for executing mechanized work, including equipment operators from the leading professions among the members of the construction crew and training workers in closely related professions to operate several types of equipment sharply increases the productivity and efficiency of labor.

High quality and timely, periodic technical maintenance and repairs are important prerequisites for further improving the utilization of machinery and for lowering the labor consumption needed to keep them in working order.

Perfecting organizational systems of management for equipment yards is one of the important prerequisites for further improving the

utilization of technology for construction. The concentration of construction machinery in specialized trusts and administrations based on machinery use is a positive approach.

Operating mechanization administrations and trusts have become powerful specialized construction organizations and their staffs of thousands are successfully working to complete the construction program. The activities of these organizations are characterized by the many varying problems that arise, many of which do not have standard solutions, and a creative approach is required to determine the methods and means for completing the mechanized work by considering the specific conditions.

However, for several construction central boards and republic construction ministries and departments the role of mechanization administrations and trusts, as before, is minimal in organizing the work of machinery and their active influence on the technology used in the construction process as stipulated by the regulations approved by the USSR Gosstroy concerning mechanization administrations and trusts and a number of mechanization administrations and trusts do not give the attention needed to organize the work of machinery efficiently and to advanced methods for executing mechanized work which negatively affects the increase in the technological level of construction.

Mechanization administrations and trusts, together with construction administrations, must systematically deal with the problem of the load on machinery everywhere, paying special attention to the timely completion of preparatory work. Allocating machinery to sites must be done only when a corresponding working front is available and when standard operating times for machinery have been established for the given site.

Establishing a standard time for keeping machinery at a site, agreed to by construction and mechanization administrations, determines the efficient organization of work at a construction site and increases the responsibilities of the parties for utilizing techniques and adhering to the technology used in production work.

Implementing work together with the general contractor by means of providing selected machinery for specific conditions, assigning them along with service personnel and actively participating in the efficient organization of the work of the machinery which is provided is a principal type of activity of mechanization administrations.

However, the practice of turning over mechanized devices to trusts for implementing work dealing with laying out pile foundations, sewerage systems, water mains, plastering, painting, roofing, and other types of construction work cannot be recommended for use on a broad scale just because equipment operators can organize the technological process and achieve high levels of labor productivity.

High indices of labor productivity should accompany the observance of construction standards and regulations which ensure the reliability and quality of erected structures; this is the obligation of construction worker specialists who have done the corresponding preparatory work and is not the equipment operators' responsibility.

The task of equipment operators in construction production consists of implementing the technology for the mechanized process with the aid of new machinery before the non-mechanized work is begun and ensuring that advanced methods for implementing it are introduced into practice for large-scale construction production with direct participation by equipment operators.

With the aim of increasing the technical level of servicing machinery and improving the utilization of capacities at specialized maintenance enterprises the plan for 1980 specifies that more than 75 percent of repairs and maintenance for single bucket excavators, scrapers, bulldozers, truck cranes and tractors are to be completed at centralized plants.

The decisions made at the November 1979 Plenum of the CPSU Central Committee obligates all personnel to carefully consider existing potentials and possibilities and for each production staff to wage a battle for a more complete utilization of basic production funds and each piece of equipment and to economize fuel and electricity. In this regard it is exceptionally important to fully exploit the key factors that have economic influence.

In recent years a number of state standards have been worked out and put into practice which have increased the responsibility of manufacturers and developers of machinery for their quality and operating reliability and for working out and delivering maintenance documentation to the users on time.

At the same time these documents determine the obligations of the machinery users in the section on observing the regulations for the utilization and maintenance of the machinery which is regulated by the above documentation and the instructions of the plant manufacturer. All of this should ensure an increase in the technical level and efficiency of utilizing construction technology.

In accordance with the above state standards and with the aim of improving the planning of preventive maintenance and technical service for machinery PPR [Planned Preventive Maintenance] SN-207-68 Instructions, which were previously in force, were rescinded and since 1979 the "Recommendations for Organizing the Technical Service and Maintenance of Machinery," which were worked out by institutes at the Ministry of Construction and Road Building Machinery and USSR Gosstroy, have been in effect; on the basis of this, recommendations have been made

to plant manufacturers of machinery concerning technical service and maintenance in accordance with the GOST [State Standards] which are obligatory for users.

This document also specifies an improvement in calculating and planning preventive maintenance of construction technology. Along with the calculations that are used in construction for determining the amount of time that machinery is in operation during shifts, calculations of machinery output during operating hours have also been established based on meters; for machines which do not have meters that record operating time calculations were made by means of a time study of machine usage during shifts according to the method cited in the Recommendations. The value for machinery output during operating hours does not include start-up and shut-down times and the organizational-technological idle time of machinery during shifts; for this reason it cannot be a basis for computing the time spent operating machinery or for calculating the pay of equipment operators.

On the basis of the practical output of machinery during operating hours the execution of technical service work for machinery is planned and expenditures of fuel and lubricants are controlled as well as the reliability of the assemblies which are guaranteed by the plants, the quality of repairs and others.

Introducing into practice calculations of actual output during operating hours for planning PPR makes it possible to eliminate unnecessary idle time for machinery and to accomplish technical service at sites that are not intensively using the machinery while at the same time eliminating unplanned idle time for machinery when it is used intensively. In both cases planning the work according to the shift time led to unjustifiable labor consumption and material resources and also made it impossible for the machine building industry to make any justifiable claims concerning the quality of the machinery and assemblies which they supplied.

Calculations of machinery output during operating hours make it possible for mechanization administrations to wage a battle for the economic use of fuel and energy resources when utilizing construction technology and at the same time they make a perceptible contribution toward implementing the decisions that were approved by the November (1979) Plenum of the CPSU Central Committee.

However, as the inspections which were conducted in 1979 show, calculations for planning PPR of machinery based on output during operating hours are being organized extremely slowly. Construction ministries and departments must take effective measures to improve calculations for machinery operations.

Improving the organization of work and the utilization of trucks has an important influence on the pace of construction production. All the same the idle time of trucks during loading and unloading operations is high due to poor access routes and insufficient equipment and organization for loading and unloading work.

Motor vehicle transport long ago became one of the most important technological links in the mechanization of construction production. The role of specialized transport has especially grown without which the transporting of new advanced structures and articles which are used at construction sites would be either practically impossible or extremely inefficient. Thus, generally speaking, it would be impossible to transport large-size, thin-walled reinforced concrete items, wide-span reinforced concrete girders, pipe runners, glued wooden structures and other assembled items for general use. Delivery of premixed cement and other mixtures also requires the use of special means of transportation.

The approved plan for the complex mechanization and automation of construction-assembly work in 1980 establishes quotas for construction ministries and departments to improve efficiency in utilizing trucks and increase the volume of cargo transported in trailers, quotas for organizing advanced methods of cargo delivery and increasing the technical level of motor vehicle use as well as quotas for manufacturing special means of transportation at construction ministry enterprises.

The plan sets tasks for checking, under production conditions, the efficiency of using newly made construction machinery which was turned out by the manufacturing party. This work should be executed by scientific research institutes in conjunction with construction organizations and plant-manufacturers.

Among other measures for improving the level of planning for the national economy the CPSU Central Committee and USSR Soviet of Ministers Decree "Concerning an Improvement in Planning and Increasing the Influence of the Economic Mechanism to Improve Production Efficiency and the Quality of Work" specifies a reexamination of outdated standards for machinery and equipment and also specifies that evaluations be conducted of the technological level of machinery, equipment and other technology intended for production use that is being turned out, with the intention that measures be worked out and implemented for increasing the technical-economic indices of manufactured and newly produced articles and that outdated products be removed from production.

Mechanization administrations and trusts should take the most active participation in this important work aimed at increasing qualitative

indices by means of uncovering deficiencies in the design of machinery that has been turned out and by making general suggestions to equipment operators for improving the utilization qualities of machinery that is being supplied to the construction industry. Suggestions should also be directed to plant manufacturers and mechanization divisions in the USSR Gosstroy to control the implementation of the suggestions that were made.

The goal of complex mechanization and automation for construction-assembly work in 1980 sanctioned by the plan should be brought to the attention of each construction staff. It is extremely important that systematic control be established by construction organization managers during execution of the tasks.

The decisions of the November (1979) CPSU Central Committee Plenum and the recent session of the USSR Supreme Soviet makes it incumbent that all existing potentials should be put into operation for improving the organization of construction production and the utilization of technology to ensure that the plan of construction work for 1980 will be fulfilled.

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NEW MACHINERY DEMONSTRATED AT MINPROMSTROY EXHIBITION

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[Article by N. F. Konstantinov, chief, Main Administration for Mechanization in Industrial Construction: "New Machinery at Projects of the USSR Ministry of Industrial Construction"]

[Text] "Increasing the Technical Level and Reducing the Labor Intensiveness of Construction within the USSR Ministry of Industrial Construction" was the theme of the plenary session of the Scientific-Technical Council of the USSR Ministry of Industrial Construction which was held in the associated pavilions of the USSR "Stroitel'stvo" Exhibition of National Economic Achievements from 29 to 31 August 1979. During the work of the session, its participants were familiarized with the products being manufactured by the ministry's enterprises. Seventy-two new machines manufactured by the ministry's maintenance enterprises designed primarily to mechanize production processes during the performance of concrete, plaster, roofing and other types of operations done entirely or partially by hand were demonstrated in the pavilions and on the exhibition grounds.

More than 11,000,000 cubic meters of cement is poured every year by organizations of the ministry and, of this amount, about 90 percent of the concrete mixture is installed by cranes fitted with buckets. Model UB-132 belt-type cement placers which have a productivity of up to 20 cubic meters per hour on a T-74 tractor base which insure delivery of the cement mixture to an installation site up to 12 meters away have come into use over the past few years. The use of belt-type cement placers makes it possible to curb labor expenditures by about 30 percent in comparison with the crane model. However, because of a lack of improvement and the inadequate span of the conveyor, belt-type cement placers cannot always be used in industrial construction. At present, pipeline transport which permits a dramatic increase in industrial production, a reduction in the loss of cement and a reduction of labor expenditures by a factor of 2-3 have come into use to deliver cement mixture to the installation sites in the projects of the ministry.

The ABN-60 truck-mounted cement pump demonstrated at the exhibition by the "Orgtekhstroy" trust and manufactured by Minsk experimental mechanical plant, "Stroymash" of the Belorussian SSR Ministry of Industiral Construction provides for vertical delivery of a cement mixture of up to 60 meters and a horizontal delivery of up to 200 meters. The cement pump is mounted on the chassis of a MAZ-500 vehicle and is equipped with an accessory distribution

boom 17 meters long which can be rotated 360° horizontally. Twenty-three truck-mounted cement pumps are in operation on the ministry's projects. The maximum productivity of the pump is 60 cubic meters per hours. Annual savings from using the truck-mounted cement pump amounts to approximately 65,000 rubles in comparison with the crane method.

The builders of the ministry are successfully using the PB-1 pneumatic unit manufactured by the Minsk experimental-mechanical plant "Stroymash" in the construction of cement couplings, in the making of soild joints and in the installation of thin-walled partitions. This unit insures delivery of a rigid cement mixture to a height of up to 30 meters or a horizontal distance of up to 150 meters. It consists of a hermetically sealed 1,000 liter vessel equipped with a mixer, control, pneumatic system and cement line. The unit operates cyclically. With the aid of compressing air, the cement mixture which is loaded into the vessel is forced into the cement line in batches and delivered to the installation point. Its productivity is 6-8 cubic meters per hour. The savings resulting from use of this unit is 6,200 rubles. In 1979, 160 of these units were set up at the ministry's project sites.

At the ministry's projects, considerable volumes of work are performed in the installation of solid-pour floors. Polishing and grinding equipment mounted on T-25 and T-40 tractors as well as the MShS-800 mosaic polisher grinder from the Minsk experimental-mechanical plant "Stroymash" that was on display are used to finish the surface of concrete floors. This machine has a frame and drive gear as well as a reducing gear with an electric motor and two face plates, each of which holds three discs with easily removeable abrasive stone. The face plates rotate in opposite directions. Control of the machine is remote. The productivity of the machine is 40 square meters per hour, the width of a pass is 800 mm. Use of the machine is conducive to a reduction in labor expenditures of 30 man-days per 1,000 square meters of area.

The progressive technique of installing solid floors by the vibro-vacuum compaction technique is increasingly gaining in popularity at the ministry's construction sites. The use of this method to install clean concrete floors results in a 15-20 percent reduction in the curing time for concrete with an increase in the strength of its surface layer; it is also conducive to a significant improvement in the quality and outward appearance of the floor. The vibro-vacuum compaction technique makes it possible to compact the concrete mass rapidly and efficiently with simultaneous leveling of the surface followed by dressing of the concrete surface by suctioning the finish with a vacuum pump. After the vacuuming process, the surface of the concrete coat is smoothed with a special machine. The set of equipment used to install concrete floors by the vibro-vacuum compaction technique is manufactured at the Kiev plant imeni Paris Commune. It consists of a vibrating beam, a vacuum set of surface suction units, polishing machines, a water take and electrical equipment. A team of five men can lay and finish up to 250 square meters of floors per shift with this set of equipment. The time involved in vacuum finishing depends on the thickness of the concrete layer and is approximately 1-1.5 minutes per centimeter. Curing and drying of the concrete layer takes place after the

vacuum process which makes it possible to polish it immediately with a special machine. Finishing is done 3-5 hours after the preliminary polishing after changing the discs on the polishing machine to blades. As a result of the clean polishing process, the surface of the floor becomes perfectly smooth and takes on a metalic sheen.

The use of stock metal and wood-metal forms manufactured centrally at the ministry's enterprises is an important trend in reducing expenditures of hand labor on concrete operations. The introduction of standard form-work makes it possible to mechanize its installation and drastically reduce the cost for lumber as well as to cut labor expenditures by 50-60 percent. Approximately 95 sets of three-dimensional universal standard-metal dorms for concreting footings measuring 7 X 7 X 7 meters and weighing 11 tons are produced each year at the Ufimskiy plant "Remstroydormash." Rebuilding the set of forms at another site is done without knocking it down. Using the set of forms makes it possible to reduce the cost of installation of 1 cubic meter of concrete by 2.5 rubles. The reusability of a single set is 200-300 cycles.

The use of adjustable large-panel form work, production of which has been developed by the Donsk "Remstroymash" plant is quite promising. This form work is used to concrete transverse bearing walls of buildings with pre-cast concrete as well as with poured-in-place ceiling-floors. This form work makes it possible to concrete a wall panel 160-510mm thick, 1,500 mm high and up to 7,500 mm long. The savings from introducing a single set of form work is 90,000 rubles per year.

At present, in excess of 4,000,000 cubic meters of concrete are being installed with the use of standard form work and up to 30,000 square meters of residential and social-cultural use buildings are being erected annually.

A slip form for the construction of bearing walls and the ceiling-floors in multi-story buildings is coming into increasingly extensive use. The equipment for slip forms is made by the Kiev plant imeni Paris Commune. This plant produces the reversible RGD-66A hydraulic jacks, OGD-64U hydraulic jacks with the ARG-64U horizontal regulator for automatic leveling of the form work. Activation of the jacks is done by an ANS-125B pump distribution station with an impulse counter accessory that automatically measures the number of strokes for the OGD-64U jack raising the formwork. The station can operate in three modes: automatic, semi-automatic and manual. The automatic mode makes it possible to switch on the pumping station from a time relay and turn it off via a pressure relay (when the pressure in the hydrosystem exceeds the allowable level). The power stroke (step) of the jack is 30 mm, the working pressure is 9.8 MPa. During 1978, approximately 28,000 square meters of residential and public buildings were built in slip forms by organizations of the ministry.

The ministry is engaged in continuous work to increase the level of comprehensive mechanization in the construction of buildings from three dimensional cells; the technology of unit manufacture is being upgraded, special transport to deliver them to construction sites is being developed as are resources of mechanization and rigging to assemble the units such as heavy-load trailers, unit haulers, strapping and traverse bars with capacities of up to 25 tons.

A mock-up of the MSK-400 special self-propelled assembly crane being produced by the Donsk installation-assembly plant "Remstroymash" was demonstrated at the exhibition. This crane is intended for the assembly of residential, administrative and industrial buildings up to 16 stories high (52 meters) built from three-dimensional cell units weighing 12 tons on a hook span of 25 meters and 20 tons on a hook span of 20 meters. The crane has a fully rotational telescoping tower and channel (maneuverable) boom with a sliding carriage. The crane is easy to use and can be moved from project to project in its assembled form on roller bogies. Savings resulting from the use of this crane in three-dimensional construction amount to 122,000 rubles per year.

A non-crane technique for the assembly of buildings is being introduced within the ministry's organization. In 1978, buildings with an area of approximately 20,000 square meters were built by Armenian SSR Ministry of Industrial Construction by the technique of elevating the stories and ceiling-floors. The equipment and rigging to hoist stories and ceiling-floors is made by the "Strommashremont" firm and the Yerevan metal-structure plant. The set includes a total of 36 electromechanical hoists, each with a capacity of 45 tons, a cabinet for electrical equipment, three control panels and a special stationary tower crane with a carriage that has a hoisting capacity of 5 tons. This available equipment makes it possible to conduct the entire technological process by the comprehensive mechanization technique.

The VS-18-MS and VS-22-MS construction derricks which have capacities of 250 kg and are designed to lift personnel to a height of 19 or 22 meters, respectively for the conduct of various installation and maintenance operations are in great demand among builders; the boom spans of these derricks are 8 and 9.5 meters. The derricks consist of fully-rotational hydraulic hoists mounted on a truck chassis fitted with four hydraulic telescoping supports. They are outfitted with a system of assemblies that insure vertical sling orientation, restriction of the operational zone and prevent flexing and overload of the boom. The savings resulting from introduction of a single derrick amounts to 5,200 rubles annually.

As a result of the development of high-rise construction, the question of supplying goods and moving personnel has become especially acute. Within the ministry, it is being solved by use of the PR-1-172 rack-type freight and personnel elevator which has a capacity of up to 500 kg and is manufactured by the Krasnodar maintenance mechanical plant. This elevator has a guide pole and rack, a cab with two sets of double doors and a control mechanism. Cabin movement is accomplished by rotating the two sprockets engaged by a toothed rack. The elevator has a centrifugal speed governor, an eccentric catch pin, an emergency cab movement mechanism, a device for precise stopping of the cab between floors, limit switches and a sound signal. The elevator is equipped with an assembly unit to install the mast. The savings resulting from the introduction of the rack elevator amounts to 2,600 rubles annually.

Cargo-hoisting machinery insuring the delivery of building materials to the floors of buildings under construction through window openings were demonstrated at the exhibition. As many as 150 TP-5 (S-953) structural mast elevators

with load capacities of 500 kg in four standard sizes with lifting heights of 29, 38, 50 and 62 meters are being produced every year by the plants of the ministry. Various building materials, including those of long dimension can be delivered to window and door openings at distance of up to 3.5 meters by an elevator.

The ministry's maintenance and re air enterprises are producing small-sized easily knocked down transport cranes of the K-1 type which are designed to hoist various building materials weighing up to 300 kg to floors and roofs up to 50 meters high. The basic units of the crane are two support, a twin-channel beam, a cargo bogie and a load block and tackle. A winch consisting of a motor drum with wave gearing mounted on it is fixed on one of the supports. The winch drum has automatic shoe brakes. The crane is controlled from a push-button control panel. For movement from place to place, the crane is easily knocked down into units weighting up to 60 kg and the entire weight of the crane and counterweights is 440 kg. The savings from using a single crane runs to more than 700 rubles per year.

The OK-120.0M transport crane which is set up in window openings and is designed to supply various goods to floors has commended itself well in construction. The crane consists of beams, electric hoists, four telescoping struts and three screw clamps and weighs 90 kg. For repositioning, it is easily knocked down into units that can be carried by one man. This crane makes it possible to lift goods weighing up to 120 kg to a height of 30 meters.

An important factor that will have an effect on any acceleration in the pace of the construction industry is the timely delivery of various building materials to the construction site. This problem is being resolved within the ministry through the mass introduction of containerized and packaged deliveries of building materials which are conducive to comprehensive mechanization of the loading-offloading processes throughout the entire network of cargo delivery and will drastically reduce expenditures of hand labor.

At the beginning of the current five year plan, approximately 15,500 employees within the ministry were involved in loading-offloading operations of which 27 percent were doing manual labor. An especially large volume of hand labor was involved in the delivery of piece and granulated materials. In terms of their specific weight, these goods amount to 1-1.5 percent of the total volume while the labor expendures for handling them were equal to 30 percent of the total volume. The development of organizations handling the overall supply of building materials, the introduction of containerization and packaging make it possible to resolve this important social goal of elminating hand labor. During the 3 years of the current five year plan, as a result of upgrading the functioning of the industrial-technological setting-up services and increasing mechanization in loading-offloading operations, 3,500 employees have been released. Approximately 220 trusts within the ministry have made the transition from an office of material-technical supply to resource support through administrations for industrial-technological set-up. Virtually the entire volume of paint and varnish materials, spackling and pastes is being produced at bases;

the volume of wallpaper preparation is 56 percent, that for glass is 60 percent, and that for linoleum is 33 percent. Approximately 12,000 different containers, some of which were on display at the exhibition are being produced every year for the delivery of building materials by plants under the Main Administration for Mechanization in the Construction Industry. At present, about 30 percent of all construction goods are being shipped in containers. The needs of builders for containers for storing and transporting glass, glazed window and door units, roofing, roll goods, wallpaper, ceramic pipe, slag wool, cement and other building materials and articles are being almost totally fulfilled.

The effectiveness of introducing containerization is extremely perceptible. The savings resulting from the introduction of containers to ship only one ton of cargo amount to 1.2-3 rubles. The introduction of containers within the USSR Ministry of Industrial Construction system provides savings of about two million rubles every year and makes it possible to release nearly 1,200 employees from tedious hand labor.

The dismountable A-825 portal crane which is mounted on a ZIL-130 truck (Figure 1) and manufactured by the Petrozavodskiy experimental mechanical plant "Remstroymash" and designed to load and offload various piece- and packaged cargoes on dup trucks as well as containers weighing up to 1.25 tons was shown at the exhibition. It has a frame mounted on a truck bed from the outside of the lateral sides, a portal and cargo carriage, four hydraulic cylinders, a power take off with an oil pump and hydraulic distributor.

The raising and lowering of cargo is done by two hydraulic cylinders through a cable block mechanism. Vertical rotation of the portal as well as placing it in the transport position (on the support) is done by a second pair of hydraulic cylinders. The crane's hydraulic system has valves to prevent overloading. The savings resulting from introduction of the crane (container hauler) amounts to 3,600 rubles.

The S-832 sounding device which is mounted on a ZIL-131 truck and manufactured by the Omsk Experimental Maintenance Plant was shown at the exhibition. It is designed to investigate the bearing capacity of soils by static insertion of a probe which has tensometric sensors fixed on the end piece. Signals from the sensors which characterize the force on the lateral and frontal surface of the probe are automatically recorded on a diagram tape. All the major mechanisms of the unit are activated by hydraulic cylinders. The sounding depth is up to 21 meters. The productivity of the unit is one point per hour. The savings resulting from the use of this unit is about 108,000 rubles per year in comparison with pile testing by traditional methods.

Various types of pile-driving equipment are being made by the ministry's plants to insert pilings. Pile-driving units on the T-40, T-100 and T-130 tractors and the KrAZ truck have commended themselves excellently. The advantages of this equipment include its mobility, its usefulness for driving both scattered pilings as well as piling clusters and floors, speed of assembly and breakdown and its high level of productivity. This equipment makes it possible to complete the insertion of a piling up to 16 meters long.

Thus, the KN-4 unit on the T-40M tractor (Figure 2) which was demonstrated at the exhibition is designed to insert vertical and slanted pilings with a small section (15 X 15, 12 X 12 and 10 X 10 cm) up to 4 meters long and weighing up to 700 kg. The unit's pile driver is mounted on a frame which is fastened to the tractor and equipped with a DM-240 hammer. The annual savings from introduction of this unit amount to 3,500 rubles.

The mobile KO-8 pile driver on a KrAZ-257K truck (Figure 3) which is designed to insert vertical and slanted pilings at scattered projects, to insert test pilings during geological studies and to insert column pilings for agricultural buildings is of interest. It uses an S-995 diesel hammer as the driver. Control of all the hammer's equipment is hydraulic and the control panel is located in the truck's cab. The pile driver permits insertion of pilings measuring 30 X 30 centimeters up to 8 meters long. The pile-driving equipment can be shifted into the transport position and back without any sort of disassembly or the use of any kind of hoisting machinery in a span of 10 minutes. The annual savings from introducing this pile driver is approximately 10,000 rubles.

The Scientific-Research Institute for Industrial Construction has developed pile-driving equipment mounted on T-100 or T-130 caterpillar tractors of standard configuration that insures insertion of pilings up to 10 meters long or up to 16 meters on tractors with a swamp configuration.

All pile-driving units manufactured by the ministry's mechanical maintenance plants have PKV-1 vertical-plumb control instruments which aid in insuring the alignment of the hammer masts in two guides set perpendicular to each other as well as the alignment of pilings inserted at an angle (up to 20°). This instrument consists of a sensor and an indicator and operates within a temperature range of +50 to -30°C; the tolerable error factor does not exceed $\pm$ 15 minutes. Savings from the use of this instrument runs to 600 rubles per year.

The special US-2 unit which is mounted on an EO-2621 excavator and which runs off its hydraulic system is used as the ministry's projects to cut the heads of pilings off at the disgnated level. This unit develops a maximum force of up to 80 tons of force and insures the cutting of a piling 300 X 300 mm. The savings resulting from its introduction is about 700 rubles.

To loosen frozen soil, to compack soil in hard-to-reach places and to break up old ferro-cement structures, MUR-1250 hydraulic hammers are being used at the ministry's project sites which develop on impact energy of 18 kJ when the weight of the impact portion is 1,250 kg. The hydraulic hammer is mounted on the boom of an EO-4121 excavator and runs off its hydraulic system. The savings from using a single hydraulic hammer is about 31,000 rubles per year.

Finish work continues to be the most labor-intensive in construction at present. Within the USSR Ministry of Industrial Construction, 22.5 percent of the total number of contract organization employees are engaged in the performance of plaster, paint and paneling operations. Approximately 50 percent

are doing manual work in plaster operations, 60 percent are involved in painting operations and about 85 percent of the personnel in this trade are involved in wallpapering. The level of mechanization in plastering and painting operations is nearly 80 percent.

The Krasnodarsk mechanical maintenance plant has developed production of the UShOS-4/2.5 headed plastering station which is designed for the comprehensive mechanization of plastering work. It uses imported mortar mixes, provides for delivery of 2.5 cubic meters of a lime-base mortar with a fluidity of 4-5 centimeters based on the Central Scientific-Research Laboratory for Construction (StroyTsNIL) cone, reduction to a working consistency (8-10 cm), its delivery to the work site and application on the surface. Use of the station is possible when the surrounding air temperature is from +35 to -25°C. The shape of the station's receiving hopper does not have "dead zones," a special mixing unit insures the high-quality and complete discharge of the mortar mix. The station's make up includes a compressor unit, current frequency transformers, nozzles, an electric cord, hoses and remote equipment accessories. There is a tank with a heater unit for technological water. Asll the station's equipment is mounted on a heater unit set on sled rails. The station is transported from project to project on a trailer or a ZIL-130 truck bed. The savings resulting from the use of a single station amount to approximately 4,900 rubles annually.

The "Salyut-2" (summer model) (Figure 4) plaster station has become popular for the delivery and application of rigid mortar mixes within the ministry. This station has a dual-piston compensation pump, it is intended for the pulse-free delivery of low-fluidity plaster mixes and was developed by the "Ukrorgtekhstroy" Institute.

In contrast to the UShOS-4/2.5 plaster station, the "Salyut-2" station provides for the delivery of a mortar mix with a StroyTsNIL cone slump of 6-8 cm which makes it possible to apply a layer of plaster with the necessary thickness in one pass, significantly reducing loss of the mix and cutting labor expenditures as well. The delivery distance for mortar mix is 150 meters horizontally and 60 meters vertically with the "Salyut-2" plastering station which is approximately twice that of the UShOS-4/2.5 station. However, a number of flaws in the operation of the "Salyut-2" station were discovered in comparison tests of the "Salyut-2" and SO-114 station at the Minsk branch of the All-Union Scientific-Research and Structural Design Institute for Mechanized and Hand Construction-Assembly Tools, Vibrators and Finishing Equipment in 1978 at projects of the Main Administration for Residential and Public Construction in the city of Moscow. At this time, these shortcomings have generally been eliminated. A winter model of the "Salyut-2" station has been developed by the "Ukrorgtekhstroy" Institute. The savings resulting from the introduction of a plastering station with an impulse-free pump is approximately 46,000 rubles and labor expenditures are reduced by 6,000 man-days in comparison with the UShOS-4/2.5 station.

The ANSh-4 (Figure 5) spackling and painting unit which is used primarily to deliver and apply adhesive spackling compounds with a fluidity of 6 cm based on the StroyTsNIL cone was shown at the exhibition. The technical productivity of this unit when the thickness of the spackling compound layer is up to 2 mm is 340 square meters/hour. It consists of a piston pump, receiving hopper, control and rubber sleeves and develops a pressure of up to 10 Kg/cm^2.

The 4M-168 painting unit has commended itself well in the surface application of calciferous as well as water-emulsion paint compounds. The unit consists of a tank with a capacity of 160 liters, a centrifugal pump, electrical controls, spreader brushes and a control panel. The productivity for painting with water emulsion compounds using four spray wands is 2,000 square meters/hour.

The NPB-2 pistonless pump which consists of an electric control, a crank and rod mechanism, diaphragms and a pressure regulator is successfully being used to apply water-based paints, antiseptic and fire-proofing solutions. The pump's output is 0.8 cubic meters per hour, the maximum pressure is 15 kG/cm^2, the vertical delivery distance is up to 40 meters and the horizontal delivery distance is 100 meters. Annual savings from using this pump amount to 200 rubles.

Production of a set of machinery and accessories to glue wallpapers has been developed at the ministry's maintenance enterprises. This includes the PRO-2 semi-automatic unit to cut wallpapers, containers to deliver them to projects, a paper hanger's table, equipment to apply adhesive to wallpapers and scaffolding.

The PRO-2 semi-automatic paper cutter is designed to cut large wallpaper bolts with random-match patterns into pieces of a fixed length by the method of crosswise perforation with simultaneous trimming of the edges. Adjustments and automatic switching on of the perforating device are made by rapidly removeable measuring chains. The unit comes with a programmable counter which permits an allotted number of perforations (from 1 to 70). The annual savings from the use of this unit is 2,400 rubles.

A great deal of effort is being made to mechanize roofing operations. Every year, about 26 million square meters of roofing are made from roll goods at the ministry's construction projects. About 12,000 workers are involved in the performance of roofing operations, half of who have been working by hand until just recently. At present, sets of equipment consisting of the portable PKU-35 unit to transport and deliver mastic to the roof, machines to deliver mastics and roll materials on the roof, equipment to reroll rolled materials. and rollers to smooth the materials are being produced for the purpose of mechanizing roof installation within the ministry. The production of machinery to unroll rolled goods, extract water and dry foundations has been mastered. Equipment to heat tar with induction currents and make up bituminous mastics in construction settings are being developed. The greatest effect from the standpoint of mechanizing labor intensive processes and replace tedious hand labor

in the conduct of roofing operations is being achieved through the introduction of fusible ruberoid. During 1978, 7,200,000 square meters were laid which was conducive to a reduction in labor expenditures by 180,000 man-days and which resulted in a savings of more than 2,000,000 rubles. All organizations within the ministry have mastered the technology of using it. The flame method of heating a mastic layer using blow torches that run on liquid fuel or gas has become quite popular. Gluing the ruberoid is done with reel-type rolers. The savings from the use of fusible ruberoid amount to approximately 1,150,000 rubles per square meter for a three-layer roof in comparison with standard materials. Team standard kits have been developed and in use since 1975 to elevate the level of mechanization in the conduct of roofing operations. These make it possible to perform operations with the mechanized technique by using hot and cold mastics and fusible ruberoid. In this process, the labor expenditures among teams are reduced by 1,850, 4,820 and 3,860 man-days per year respectively.

The effectiveness of the construction industry is largely dependent on the maintenance of a large fleet of construction and road-building machinery at continuing technical readiness. To a very large extent, this is the result of high-quality capital repair at specialized mechanical maintenance plants and timely technical maintenance by specialized teams. The self-propelled MSS-130 lubricating stations mounted on ZIL-130 trucks and portable MTO-52-04 shops for routine technical maintenance that are mounted on GAZ-52 trucks are being manufactured to equip these teams in mechanical maintenance enterprises within the ministry. Welding equipment on a trailer, an electric grinding unit, bench vises, drill press, electric generator, carpenter's bench and gas welding equipment are a part of the shop. These pieces of equipment are designed for a centralized system of technical maintenance of machinery which, during 1979, including approximately 16,000 excavators, bulldozers and cranes. Altogether, within the ministry's enterprises, various resources of mechanization totalling about 44,000,000 rubles are being produced every year.

9003
CSO: 1821

BUILDING MATERIALS

KAZAKHSTAN STEPS UP BUILDING MATERIALS INDUSTRY CONSTRUCTION

Moscow DEN'GI I KREDIT in Russian No 12, Dec 79 pp 46-49

[Article by G. Ye. Murzagaliyev, manager of the Kazakh Republic Stroybank Office: "Increase the Activeness of Bank Influence"]

[Text] Kazakhstan builders achieved significant labor successes and contributions during the initial years of the 10th Five-Year Plan. They are doing more and more work each year and increasing the number of production and nonproduction facilities being put into operation. Thanks to this, the economic might of our republic is growing and the well-being of the people is improving.

State capital investments in the republic are constantly growing. Su ice it to say that during the first three years of the current five-year plan, 18.2 billion rubles in capital investment has been utilized. In Kazakhstan, a large number of major enterprises and shops equipped in accordance with the demands of scientific and technical progress is put into operation each year.

In 1978, fixed assets worth 5.2 billion rubles were put into operation through state capital investments (production and nonproduction facilities); that is 44.2 percent more than in 1977. All the basic branches of republic industry have been developing at accelerated rates.

Continued growth in our economic potential will depend largely on successful implementation of the capital construction program and on raising its technical level and the skill of its personnel. In this connection, we are faced with substantially reducing construction time, with expanding and renovating enterprises and facilities. This is being ensured, as we know, by concentrating monetary, material and labor resources on start-up projects, by improving the organization of construction production, and foremost by raising the level of its industrialization.

Industrialization is the basic direction of scientific and technical progress in construction. It assumes a higher level of organization of the production technology and standards in construction-installation work and

is based on the systematic up-dating and expansion of the production stocks of the construction and building materials industries. It was noted at the 25th CPSU Congress that it is very important that each ruble spent to develop industry yield a return as quickly as possible.

One important requisite to carrying out this task successfully is the changeover to producing and introducing into construction the most progressive components and most effective materials.

Kazakhstan builders have available to them a large construction industry base. For example, the industrial enterprises of the Kazakh SSR Ministry of Construction of Heavy Industry Enterprises, one of the republic's main construction ministries, has available to it capacities to produce about two million cubic meters of prefabricated reinforced concrete items, which meets nearly all the demand by ministry construction organizations, more than five million cubic meters of nonmetallic materials and 9.6 million square meters of panelling.

For industrial enterprises of the Kazakh SSR Ministry of Building Materials Industry, the annual volume of industrial output sold in 1978 was 390.1 million rubles. Enterprises of this ministry have available to them large capacities for producing cement, shingles, soft roofing materials, brick and other building materials.

The production of items made with efficient types of concrete, lightweight steel, aluminum and asbestos cement components, porous aggregates, insulating and other materials has been developed. Capacities for producing items made with lightweight concretes using porous aggregates have been created at prefabricated reinforced concrete enterprises, and especially in housebuilding combines.

At the same time, an analysis of 1979 capital construction plans made by bank institutions and a check on the provision of planned facilities with contractor organization capacities show that the level of development of the construction production base which has been achieved still does not fully meet modern requirements. Certain contractor organizations building in relatively unutilized regions do not have the necessary production base to perform the construction and installation work, which is increasing in volume year after year.

With a view towards eliminating the deficit in building materials, as well as towards performing increasing amounts of construction and installation work, the Kazakh SSR Ministry of Construction of Heavy Industry Enterprises is building in 1979 more than 30 industrial enterprises to produce building materials. These enterprises will produce more than 150,000 cubic meters of reinforced concrete items, about 70,000 square meters of splint-slab sheets, parquet boards and floor panels, and other building materials needed to carry out the construction program successfully.

In the next 2-3 years, we plan to build production bases for construction organizations located in promising construction regions so as to successfully resolve the task of further increasing the republic's industrial potential.

Major reserves for increasing capital investment effectiveness are concealed in the prompt, full utilization of the funds allocated. Thus, capital investments totalling 412,5 million rubles were anticipated for developing the production base of the Kazakh SSR Ministry of Construction of Heavy Industry Enterprises in the Ninth Five-Year Plan, but only 378.9 million rubles, or 91.8 percent of the planned assignment, was actually utilized. Plans for capital investment and for putting fixed assets and production capacities into operation have not been fully met in the initial years of the 10th Five-Year Plan either.

One reason for the unsatisfactory utilization of capital investments is the failure to open up financing at the proper time.

Construction of a number of construction industry enterprises to produce building materials in the republic is being done with the proportionate participation of the ministries. However, individual ministries are failing to transmit funds promptly for the construction of such facilities. Thus, in 1978, the USSR Ministry of Nonferrous Metallurgy waited until September to transfer two million rubles to the republic Ministry of Construction of Heavy Industry Enterprises to create production bases for construction of the Zhayremskiy Ore Enrichment Combine in Dzhezkazganskaya Oblast and the Zhezkentskiy Ore Enrichment Combine in Semipalatinskaya Oblast. In 1979, there have been similar instances connected with the failure to transmit funds promptly to client ministries for the construction of construction industry facilities.

There is also another problem. A number of ministries and departments are obligated each year to transfer certain funds to the Ministry of Building Materials Industry to develop the production of brick and other local building materials. In practice, they generally transfer the funds after approval of the state economic and social development plan and therefore prior to its approval, the republic Ministry of Building Materials Industry does not have available to it data on the amounts of capital investment and where it will be sent to build what enterprises. In this connection, it cannot order equipment at the proper time for the local building materials enterprises being built. And here, using this partial example, we would seem to approach a major problem in capital construction, that of observing construction duration and estimated cost norms.

Construction of a number of republic enterprises is taking a long time, which considerably exceeds construction duration norms. Thus, it has taken 10 years so far to put up associated construction industry and building materials enterprises in Lisakovsk, Kustanayskaya Oblast (given a construction duration norm of five years). This year, the Karaganda House-[illegible] Combine's renovation will finally be completed. One of the main reasons for the failure to meet schedules for putting them into operation on time has been the poor quality of the estimate-planning documentation.

Client ministries and planning organizations do not always approach determining the calculated estimated cost and capacities of enterprises being planned with adequate substantiation. For a number of construction projects studied during the period in which estimate-planning documentation was being developed, the estimated cost of construction was considerably overstated without increasing capacities. When estimate-planning documentation for a number of enterprises under construction was reviewed, basic technical and economic indicators deteriorated: growth in specific capital investment per unit of capacity, increase in time needed to recompense capital investments, and so on. There have also been cases of failure to carry out planning work at the proper time. For example, development of the technical plans for construction of the Karaganda Ceramic Wall Materials Plant was stretched out four months beyond schedule. Due to the lack of blueprints in the first year of construction, work was only begun in August (instead of April). The documentation submitted was of poor quality. As a result, the state arbitration commission decided to fine the client (the directorate of enterprises of the wall materials plant being built) a total of 83,000 rubles for poor-quality estimate-planning documentation and failure to transmit it at the proper time.

Estimate-planning documentation is not always worked out with consideration of the possibility of providing construction projects with capital investments and materials. As a result, the documentation developed is not used for long periods and becomes obsolescent. Expenditures on drawing up such documentation are often written off as being worthless. Thus, 1.5 million rubles was written off as unproductive expenditures on planning-survey work for the Kazakh SSR Ministry of Building Materials Industry during 1971-1979 and 100,000 rubles was written off for the republic Ministry of Construction of Heavy Industry Enterprises.

At the same time, in speaking of shortcomings and available reserves in the field of construction, we must not fail to mention the incomplete use of capacities already in operation and the fact that planning errors also impact in this area. Thus, existing capacities for producing prefabricated reinforced concrete components and parts were only 80 percent utilized for the Kazakh SSR Ministry of Construction of Heavy Industry Enterprises in 1978, in which connection much needed output failed to reach builders.

Return on capital indicators over a number of years testify to the inadequate use of capacities in the Kazakh SSR Ministry of Building Materials Industry. The main reasons for the failure to utilize capacities promptly and use them fully are errors in plans, unfinished construction, and shortcomings in production organization and equipment operation. That is why it is so important to improve bank work aimed at increasing capital investment effectiveness at the planning and design stages and during construction, to intensify bank supervision of the start-up of projects and of the return on invested capital.

As is known, Stroybank institutions check the inclusion of construction projects in capital construction plans, titles lists and intrasite titles lists, the availability of designs and estimates approved according to established

procedure at construction sites, of documents confirming that expert advice as been obtained, and the use of standard plans in all instances anticipated by regulations in effect, prior to the start of financing.

The Rules of Financing prohibit financing projects and expenditures not covered in estimate-planning documentation. However, practice has shown that individual ministries and departments have included in their plans construction projects in violation of these requirements. In this connection, Stroybank institutions are doing a great deal of purposeful work at the stage of drawing up draft plans for economic and social development on preventing the inclusion in plans of construction projects not covered by estimate-planning documentation. For example, checks show that as of 1 September 1978, the 1979 construction plan draft included 73 projects for which the annual volumes of construction and installation work did not include 121 million rubles worth of blueprints, estimates, technical or technical-working plans. The results of checks by the Stroybank's republic office are being communicated to the ministries and departments for appropriate action.

In order to prevent the development of unproductive estimate-planning documentation, on 1 January 1979 we analyzed in detail the composition of expenditures on unfinished construction for planning-survey work and studied the possibility of using the estimate-planning documentation already developed in construction and of thus reducing expenditures on planning-survey work. A number of clients accepted bank suggestions on reducing 1979 expenditures on planning 38 projects at an estimated construction cost of 62 million rubles and an annual (1979) volume of 760,000 rubles.

In order to prevent the scattering of capital investments among numerous construction projects, the substantiation for including projects in plans is being checked when accepting titles lists of planning-survey work for construction in future years.

The possibility of expanding capacities at similar existing enterprises through renovation or retooling is being examined. Based on the results of a check by Stroybank institutions in Kazakhstan of planning-surveying work titles lists for construction in future years which was made in 1979, clients accepted bank suggestions on excluding 41 projects at an estimated construction cost of 189.3 million rubles and with anticipated planning-surveying expenditures of 1.4 million rubles.

Raising the level of construction industrialization is inseparably linked to increasing expenditures of metal, since capital construction is one of the most metal-intensive branches of the national economy. In view of the fact that one of the key tasks of economic activity at the present stage is the thrifty, efficient use of everything available to us, the republic office and its subordinate institutions have taken steps to intensify their supervision of the thrifty expenditure of metal in construction. When plans are reviewed, particular attention is paid to the substantiation for and efficiency of using metal in construction components. During 1977-1978, selective checks by bank institutions at a number of construction sites prevented the overexpenditure of 35,500 tons of metal.

In that portion of the 10th Five-Year Plan already past, qualitative changes have occurred in the development of construction industry, as has been noted. At the same time, we still run into the necessity of re-doing construction work already done, of doing more work on projects already released for operation. All this leads to significant unnecessary expenditures of labor and materials at construction sites. Bank institutions in Kazakhstan have set up ruble control of the quality of housing, cultural and personal-services construction projects. In supervising construction quality, bank institutions accept for payment accounts and documents only for completely finished projects on which all construction and installation work has been done in complete accord with plans approved under established procedures. In order to do this, prior to paying accounts for work on finished projects, bank workers carefully check the amount and quality of the work done at the site itself. If it is established that the construction is of poor quality and not all the work outlined in the approved plans has been done, the bank delays payment and simultaneously sends suggestions to appropriate agencies. Construction quality control at housing, cultural and personal-services projects has enabled us to improve construction quality at these projects and calculations in construction.

Control measurements are an important means of bank control of the reliability of report data. When instances of work cost overstatement or write-ups are revealed by Stroybank institutions, the excess funds obtained are written off from the current accounts of contractor organizations or construction sites and are restored to the financing accounts, and the write-up or overstated amounts are fined seven percent. At the same time, the wage fund calculated for the amount of work done which was checked is adjusted, as is the size of the bonuses paid and the amounts of the loans for unfinished construction.

In connection with the CPSU Central Committee and USSR Council of Ministers Decree "On Improving Planning and Strengthening the Influence of the Economic Mechanism on Improving Production Efficiency and Work Quality," we bank workers have been granted even broader rights and opportunities for influencing increasing capital investment effectiveness. Our task is to use them more actively, improve the means and methods of influencing accelerating the start-up of production capacities and facilities at construction sites begun earlier, sharply reducing the number of new construction projects, and doing everything possible to increase the effectiveness with which state funds are used.

The creation of republic construction industry industrial associations must facilitate improvement in the organization of construction production and acceleration of the introduction of the achievements of scientific and technical progress into construction industry. This will enable us to specialize enterprises and production facilities to produce a limited products list of output, to consolidate enterprises and introduce an automated control system, which will help ensure that construction industry enterprises will operate in a single stream with construction-installation organizations and will correspondingly increase capital investment effectiveness.

11052
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PROGRESS AND PROBLEMS OF SOVIET MACHINEBUILDING NOTED

Moscow PLANOVOYE KHOZYAYSTVO in Russian No 1, Jan 80, pp 24-31

[Article by A. Kobyakov, section chief of USSR Gosplan: "Machinebuilding Is the Foundation of Technical Progress"]

[Text] The CPSU's economic policy has set as a goal a steady rise in the scientific and technical level of all branches of the national economy. This means primarily more complete use of the production, scientific and technical potential that has been created in the country and, based thereon, a sharp rise in the effectiveness of social production and the quality of all work. L. I. Brezhnev, in speaking at the 25th party congres noted that "much still remains to be done to translate science's achievements rapidly not only into different--even the brightest--experimental and exhibition models but also into thousands and thousands of new types of products, beginning with specially built machines and ending with everything that is connected with improvement of the people's working and living conditions."*

A closer union of the achievements of scientific and technical progress with the advantages of the socialist economic system is necessary for the solution of this task. The acceleration of scientific and technical progress should provide for an increase in labor productivity, a lessening of the materials intensiveness of output, and a reduction in production costs and specific capital investment. Technical progress must be viewed as an integrated problem that guarantees the interplay of the main factors of economic development--labor, fixed capital and working capital for production.

Machinebuilding has a paramount role in raising the technical level of social production. Development of the machinebuilding complex is the basis for growth of production and improvement of output quality for the whole national economy. Machinebuilding is rightfully considered one of the key sectors of the socialist economy and a foundation of technical progress.

*Materialy XXV s"yezda KPSS [Papers of the 25th CPSU Congress], Moscow, Politizdat, 1978, pp 47-48.

A high-capacity machinebuilding with many branches, which is capable of satisfying the diverse requirements of the national economy and of modern implements of labor, has been established in the Soviet Union. Within the machinebuilding and metalworking sectors there are more than 8,500 production associations and enterprises, which produce more than 26 percent of the country's whole industrial output. The USSR's machinebuilding is second in the world in total volume of production and first in the output of many types of equipment and machines (tractors, combines, diesel locomotives, electric locomotives, metal-cutting machine tools, and others).

The machinebuilders are making a great contribution to the country's economic development. Based upon machines, equipment and instruments created by the machinebuilding sectors and delivered to the national economy, such modern enterprises and facilities as rolling mill No 100 for rolling wide-flange beams at the Nizhnyy Tagil Metallurgical Combine V. I. Lenin, the first line of the Volgodonsk Nuclear Machinebuilding Plant, a specially built blast furnace 5,000 cubic meters in volume at the Krivoy Rog Metallurgical Plant, the Nurek Hydroelectric Power Station with a capacity of 2.7 million kilowatts, hundreds of plants of light industry and the food, chemical and petrochemical industries, tens of large livestock-raising complexes and departments, highly mechanized mixed-feed mills, and others have been put into operation. Many of the largest machinebuilding plants--the Ural Heavy Machine Building Plant, the Motor-Vehicle Plant imeni Likhachev, the Gor'kiy Motor-Vehicle Plant, the Khar'kov and Chelyabinsk tractor plants, and others--have been rebuilt and expanded with domestic equipment as the base.

During the first 4 years of the current Five-Year Plan, machinebuilding and metalworking production volume rose by 30.8 percent, and about 8.5 million motor vehicles, 940,000 metal-cutting machine tools, 5.9 billion rubles' worth of low-voltage equipment, machines for livestock raising and feed production, and equipment for the chemical industry and spare parts therefor worth, respectively, 7.35 and 2.75 billion rubles were produced.

Along with the quantitative growth in output, machinebuilding improved product quality considerably, and the share of production of new and highly productive equipment and of output of the highest quality category with improved technical and economic indicators has been increasing from year to year. During the first 4 years of the current five-year plan the production of about 14,000 new types of machines, equipment and instruments was mastered, and more than 7,000 obsolescent articles were taken out of production. For the first time in domestic practice, specimens of a 1 million kilowatt nuclear reactor and of the country's largest power unit, with a capacity of 640,000 kilowatts, for the Sayano-Shushenskaya GES, of an automated gas transfer-pumping unit with remote control in a large-module and basement-free version, of a hydraulic stamping press with a force of 65,000 tons, of a power block of 1.2 million kilowatts capacity for the Kostromskaya GRES, and of other types of progressive equipment were developed and mastered. The power machinebuilders arranged for the output of power blocks of 500,000 and 800,000 kilowatts, which have become

basic and which permit the technical and economic indicators of electric power plant operation to be improved.

Associations and enterprises of Mintyazhmash [Ministry of Heavy and Transport Machine Building], Minkhimmash [Ministry of Chemical Machine Building] and Minavtoprom [Ministry of Automotive Industry] continue to master and produce modern units, technological lines, installations and machines of high unit capacity, including machines for the continuous casting for skelp, equipment for the 400-ton capacity converters of the oxygen-converter department of the Azovstal' metallurgical plant, equipment for underground coal mining, large walking excavators, integrated industrial lines for producing mineral fertilizer and high-tonnage oil-refining installations and also sets of equipment that will enable the withdrawal of oil from wells to be raised and the use of casing-head gas to be increased, diesel-powered dump trucks of 75- and 110-ton load capacity, dump trucks of 8-10 tons load capacity for wide use, and the KamAZ tandem trailer truck with a load capacity of 14-16 tons. Costs for moving freight have been reduced considerably.

With the close collaboration of power engineers, Minelektrotekhprom [Ministry of Electrical Equipment Industry] is mastering sets of specially built high-voltage equipment for electrical transmission lines of 1,500-kilowatts of direct current and up to 1,150 kilowatts of alternating current. The electrical equipment industry, plus the power machinebuilding industry, is the base for the development of power engineering and electrification. At the same time, electrical-equipment output finds wide use in all sectors of the national economy, determining to a great extent the technical level and quality of machinery and equipment. This industry's associations and enterprises are producing electric-drive systems for equipment for processing and preserving agricultural output, high-torque and power stepping electric motors for metal machining equipment with numerical program control, automatic electric drives with semiconductor converters for rolling mills, electrical equipment for high-capacity metallurgical installations, and new types of electric-cable items that were designed for higher voltages and heat loads.

Associations and enterprises of Minsel'khozmash [Ministry of Tractor and Agricultural Machine Building Industry] are mastering more than 200 machines of increased productivity with good technical and economic indicators; they are wider in purpose than previously produced machines and their parameters correspond to the world's technical level. During the Tenth Five-Year Plan agriculture will receive basically new machines: self-propelled six-row corn-harvesting combines and four-row potato-harvesting combines, units for processing tomatoes, cabbage and carrots, and other machines.

The makers of machinery for livestock raising and for feed production are mastering the production of equipment for mechanizing livestock-raising and poultry-raising departments. It is delivering new self-propelled silage-harvesting combines, disk feed dispensers for the proportional distribution of dry free-flowing feeds, rotating mowers for cutting

high-yield grasses, sets of equipment for preparing grass meal and for granulating mixed feeds and other equipment.

Associations and enterprises of Minstroydormash [Ministry of Construction, Road and Municipal Machine Building] are mastering and delivering rotary trenching excavators for land-reclamation operations and for the excavation of rocky soils, equipment for producing cement by the "dry" method, new cranes with telescoping booms that have been converted to motor-vehicle mounts, sets of machinery for the accelerated construction of arterial highways, machines for logging operations, and new types of mechanized construction and installing tools and construction-finishing machines.

Production aassociations and plants that make machinery for light industry and the food industry and household appliances have begun to produce: unified machines from which flow lines for various purposes are being created in dyeing and finishing departments, sets of equipment for the primary processing of cotton raw materials, automated lines for producing sterilized milk and infant-feeding products, and sets of equipment for equipping large automatic dairies. Tests of prototypes of a set of equipment for a sugar mill for processing 6,000 tons of beets per day are being conducted.

The creation and introduction of many new machines, equipment and progressive technology are yielding great economic benefit. For example, operating costs for preparing each ton of dilute nitric acid on industrial lines with a capacity of 380,000-400,000 tons of output per year is 12 percent lower than for preparation on lines with an annual capacity of 100,000 tons; and labor productivity when using a complex of DS-110 machines for rapid road construction, with a daily output of 1,600 running meters, has been increased 5-fold. With the introduction into operation in 1980 of a six-stand mill for cold-rolling sheet iron and a two-stand skin-pass mill, production of the thinnest sheet iron will grow by 30-50 percent, quality of the finished product will improve, and the annual economic benefit will be about 24 million rubles.

The introduction into production of the achievements of science and technology is improving the overall economic indicators of the work of branches of the national economy. By raising the technical level of production in 1979, operating costs for industrial output have been reduced by about 3 billion rubles; and about 400,000 people have been transferred from poorly productive manual labor to mechanized work. More than 55 percent of the total growth in labor productivity in industry and more than 60 percent of it in construction in 1979 were provided for just by implementing measures for technical progress.

The development of containerized hauling will raise the level of transport mechanization. In 1979 containerized hauling by rail increased by more than 11 million tons over 1978, 800,000 tons by sea and 750,000 tons by river transport. According to estimates, the movement of 1 million tons of freight in containers will enable up to 1,500 people to be released from loading and unloading work, operating costs for moving freight to be

reduced by more than 10 million rubles, and about 4,000 tons of metal and 200,000 cubic meters of lumber to be saved by reducing requirements for storage activities, packaging and rolling stock.

Improvement of the structure of the machinebuilding complex and the accelerated development of its branches and production facilities, which determine the pace of technical progress and create the potential for reequipping the country's productive apparatus, are the most important prerequisites to increasing production effectiveness. Our machinebuilding is being developed at a rapid pace and, in so doing, its structure is continuously undergoing progressive changes. During the current Five-Year Plan special attention is being paid to speeding up the development of special equipment for nuclear power stations. The number of power reactors is being increased 3.5-fold, petroleum apparatus 1.57-fold, forging and pressworking machines 1.48-fold, and machinery for livestock production and feed production 1.35-fold.

Structural changes in machinebuilding have been occasioned by the necessity to satisfy more fully the economy's need for new types of machines and equipment and complexes and systems of machines that will provide for economy, operating benefits and labor savings. The change in proportions is being achieved by an appropriate distribution of capital investment. Thus, during the current Five-Year Plan, with an overall 1.4-fold increase in investment in machinebuilding, increases are to be 3-fold for Minenergomash [Ministry of Power Machine Building], 2.2-fold for Minzhivmash [Ministry for Machine Building for Animal Husbandry and Fodder Production] and 2-fold for Mintyazhmash. Capital investment for developing machinebuilding for livestock production and feed production has been increased.

With improvement in the structure of machinery and equipment output, the share of output of more progressive and highly effective equipment is growing. Particularly in power machinebuilding, equipment for nuclear power stations, hydraulic turbines, waste-heat boilers and power-engineering units that operate on secondary sources will allow substantial savings of fossil fuels. Simultaneously, the share of steam turbines for power blocks of 500,000 or more kilowatts of capacity is to be raised to 36 percent in 1980 in comparison with 3 percent in 1979. By putting the RBMK-1500 reactor (instead of the RBMK-1000) into operation, nuclear power station equipment of increased unit capacity will constitute 75 percent of all output, versus 70 percent in 1979. The improvement in the structure of power-equipment production that is called for by the 1980 plan will provide annual savings of about 15 million tons of standard fuel equivalent.

Two-section mainline 2-TE10V diesel locomotives of 6,000 horsepower that are produced by the Voroshilovgrad Diesel-Locomotive Manufacturing Plant have high technical and operating characteristics. The economic benefit from operating diesel locomotives of this type that were made in 1976-1980 is about 150 million rubles.

The 1980 plan calls for an increase in the output of more productive and reliable metal-cutting machine tools, forging and pressworking machines,

and casting and wood-processing equipment. In so doing, the output of forging and pressworking machines is to outstrip that of metal-cutting machine tools by 8.3 points, against 5 points in 1979.

The share of special, specialized and ganged tools is to be increased in the mix of metal-cutting machine tools. With a total reduction of 7.3 percent in the production of metal-cutting machine tools in terms of numbers versus the 1979 level, the output of automated and semiautomated lines and automatic and semiautomatic multispindle lathes will grow by 7.5 percent, of machine tools for electrophysical and electrochemical methods of machining metals by 11.8 percent, and of machine tools with ChPU [numerical program control] by 14 percent (multiple-operation tools of this type are to increase by 30 percent). The output of mechanization equipment for forging and pressworking machines will increase greatly.

The technical level of automatic lines is being increased by equipping them with electronic control and automatic manipulators, as well as with equipment that will provide for continuity of the industrial process and for monitoring the quality of the articles being machined.

World and domestic machine tool manufacturing experience confirms the effectiveness of using program-controlled equipment. An increase in the output of progressive metal-machining equipment, including that with ChPU, will enable labor productivity in machine shops to be increased greatly.

Changes have been occuring in recent years in the regional distribution of machine-tool manufacturing. Along with further development in regions where it was previously established, new machinebuilding enterprises have appeared in practically all the Union republics and in all economic regions.

In the preceding years of the Tenth Five-Year Plan work was done in all branches of machinebuilding to improve the quality of the items produced. By 1 June 1979 the State Emblem of Quality had been conferred on 10,286 machinebuilding products. They included the multiple-operation semiautomatic lathes and automatic cylindrical grinders of the Moscow Machine-Tool Manufacturing Plant imeni S. Ordzhonikidae and the Plant for Automatic Lines imeni 50-Letiya SSSR, the ring-rolling mill of the Staryy Kramatorsk Machinebuilding Plant imeni S. Ordzhonikidze, the truck tractor of the Minsk Motor-Vehicle Plant, TBS's [thermomechanical drilling machines] of the Blagoveshchensk Amurskiy Metallist plant and other articles.

In 1978 more than 200 machinebuilding enterprises produced more than 50 percent of their output with the State Emblem of Quality. During the first 3 years of the Tenth Five-Year Plan the output of products with the State Emblem of Quality increased 1.8-fold for the machinebuilding ministries, 4-fold for Minstankoprom [Ministry of Machine Tool and Tool Building Industry], 3.5-fold for Minkhimmash, 2.8 for Minpribor [Ministry of Instrument Making, Automation Equipment, and Control Systems], 2.45 for Minlegpishchemash, 2.38 for Minsel'khozmash, 1.7-fold for Mintyazhmash and 1.6-fold for Minavtoprom. During this same period the output of goods of

the highest quality category for cultural and personal services and for household use tripled.

Economic experiments and research and testing of new management and planning methods were conducted in machinebuilding during the Tenth Five-Year Plan. Minpribor enterprises, for example, gained great management experience. The ministry converted completely to economic accountability, self-financing and self-support. In 1977-1978 Mintyazhmash, Minsel'khozmash, Minenergomash and Minelektrotekhprom converted to the new terms for planning and economic incentives, taking into account the experience gained and the results of experiments.

Planning and accounting for productive activity in accordance with net output (the standard) indicator was introduced at all Minenergomash and Mintyazhmash enterprises. The evaluation of plan fulfillment at all machinebuilding enterprises is based upon the realized volume of output in accordance with agreements.

In the Ministry of Electrical Equipment Industry a new method for planning and for incentives for scientific and technical progress was worked out and introduced successfully. Scientific-research, design-development and industrial-design institutes of all the machinebuilding ministries have been converted to the new system of planning, financing and economic incentives for operations under the new techniques.

The party, as L. I. Brezhnev noted at the November 1979 CPSU Central Committee Plenum, values the achievements of machinebuilding and sees its accelerated development as a most important prerequisite to technical progress in the whole national economy. At the same time, its development lags behind the economy's requirements. The decree of the CPSU Central Committee and the USSR Council of Ministers, "Further Development of Machinebuilding During 1978-1980," dated 20 July 1978, noted ways to speed up its progress. It stipulated concrete tasks that obligate the machinebuilding ministries to provide for a rise in the technical level and quality of the machinery and equipment produced, an increase in service life prior to overhaul of the main types of machines, improvement of the machines' reliability and longevity indicators, and improvement of the production structure. Measures for developing the production of blanks in machinebuilding were approved. USSR Minchermet [Ministry of Ferrous Metallurgy], USSR Mintsvetmet [Ministry of Nonferrous Metallurgy], Minkhimprom [Ministry of Chemical Industry], USSR Minneftekhimprom [Ministry of Petroleum Refining and Petrochemical Industry], USSR Minstroymaterialov [Ministry of Construction Materials Industry], and Minbumprom [Ministry of Pulp and Paper Industry] were assigned tasks of developing and mastering the production and providing for the delivery to the machine building ministries of new and progressive types of materials and articles that are extremely necessary and will to a great extent be the governing factor in raising the technical level of machinebuilding articles.

The important tasks set for the machinebuilders by the party and the government require a concentration of efforts on the realization of all planned goals for increasing the output of modern machinebuilding.

Goals for the first 4 years of the Five-Year Plan for the most important types of machinebuilding output were met for blast-furnace and steelmaking equipment, low-voltage electrical equipment, petroleum apparatus, instruments, automation equipment and spare parts therefor, and motor vehicles and agricultural machinery, including machinery for livestock raising and feed production. At the same time various branches of machinebuilding did not carry out the five-year plan for producing machines and equipment in the prescribed products mix. This was caused mainly by a shortage of material resources allocated to machinebuilding, especially of rolled ferrous metals, and an inadequacy in capacity for the output of some articles, as well as organizational faults in the ministries' work.

The output of types of items that are in extremely short supply is proceeding slowly because of the unsatisfactory state of affairs in capital construction. The reconstruction and technical reequipping of existing enterprises do not support the required increase in the capacity thereof. In some cases machinebuilding ministries that do not issue design and budget-estimating documentation on time and do not extend due assistance to the construction ministries are at fault for the unsatisfactory state of affairs in capital construction.

Difficulties in supporting the plan for producing machinebuilding products with material resources are growing because of the systematically inadequate delivery by USSR Ministry of Ferrous Metallurgy enterprises of rolled metal, not only in total amount but also in variety, especially progressive metal section.

Solution of the question of raising the technical level and quality of machinery is inseparably linked with improvement in the quality of the constructional materials and outfitting articles delivered to machinebuilding. The creators of machines need steel of higher strength, special rolled section, bimetals, plastics, industrial rubber articles, fuels and lubricants and other materials of improved quality. Current Five-Year Plan goals for the output of products of these types are being met with delay, and the products are being delivered to machinebuilding in inadequate amounts. New materials that will satisfy machinebuilding's requirements are being developed and mastered slowly. The series manufacture of high-quality and effective materials is being drawn out over lengthy periods. As a result, modern machines are metals intensive in construction.

The problem of an accelerated rise in the technical level of machines and equipment should be solved by the machinebuilders in close collaboration with metallurgists, chemists and scientists.

Improvement in machinebuilding-output quality is being held back also by the unsatisfactory work of certain design-development organizations. An unjustifiably long time is spent developing new types of machines and equipment, and in technical level and competitiveness they often are inferior to foreign counterparts. Design-development organizations do not have at their disposal the test bases necessary for manufacturing and testing new equipment within a short time. During the Tenth Five-Year Plan

11 machinebuilding ministries were allocated 1.6-fold more capital investment for developing test bases than during the Ninth Five-Year Plan. However, this amount does not exceed 2 percent of the capital investment for production purposes. The plan for building test bases is not being carried out satisfactorily. Because of the inadequate capacity of design-development organization test bases, incompletely developed models of machinery and equipment are sometimes sent to enterprises to be refined during production mastery and the first stages of operation.

The inadequate flexibility of machinebuilding during mastery of the production of new types of machines and equipment leads to delays in their introduction. The machinebuilding ministries are not paying due attention to timely preparation for the production and mastery of new output. The freeing of capacity that is engaged in producing less effective machinery is prolonged.

The system of certification of output also is weak in helping to speed up the removal of obsolete machines from production. In some cases state surveillance over the observance of advanced standards and specifications, especially at the stages of the development of new models and their experimental checking, is inadequately arranged for.

The main areas for developing machinebuilding were defined by the party's 25th congress, later CPSU Central Committee plenums, and the decree of the CPSU Central Committee and USSR Council of Ministers, "Improvement of Planning and Intensification of the Effect of the Management Mechanism on Raising Effectiveness and Work Quality." Among the large-scale tasks set before the machinebuilders are those of providing for a substantial growth in labor productivity and improvement of working conditions in the national economy, raising further the technical level and quality of output produced, reducing the materials and energy intensiveness of output, and developing exports.

During the Eleventh Five-Year Plan domestic machinebuilding should be developed at an accelerated pace in such most important areas as creating machinery for accomplishing basically new technological processes, raising the unit capacity and productivity of machines, creating complexes and systems of machines and reducing the metals intensiveness of machinery, increasing service-life reliability, creating automated systems for controlling industrial processes, developing specialization and concentration in machinebuilding production, improving the structure and strengthening the flexibility of machinebuilding and accelerating the rate at which it is supplied with new equipment, and developing the centralized repair of machines and production of spare parts.

The development and mastery of economically effective industrial processes for machining metal and the creation of equipment for performing these processes should occupy an important place in the activity of machinebuilders and scientists. One of the chief ways to raise effectiveness and work quality is to create new and to improve known industrial processes and to introduce them widely into practice. Among the new technologies

that are helping to improve the operating indices of production collectives and the quality of the products produced are: the manufacture of axially symmetrical parts by cross-taper rolling methods, magnetic-abrasive polishing, plasma machining of metals, the manufacture of parts by powder metallurgy, laser technology and so on. Their wide introduction will help to solve the tasks indicated.

Searches for more effective methods for planning actions for the acceleration of scientific and technical progress also are necessary. It is important that the plan for mastering new equipment promote its introduction into production within optimal periods. Goals for mastering new types of machinebuilding products should become an organic part of the plan for production and capital construction.

Methods for planning the main indicators of the technical and economic level of the output produced are to be further improved. Along with goals for raising the share of output of the highest quality category for a ministry as a whole, it is necessary to plan goals also for severely short types of machines and equipment. In the long term the machinebuilders are to solve also questions of increasing the output of highly effective equipment for supplying the fuel-and-power complex, heavy industry branches, agriculture and transport, which were not able to specify them in the necessary amounts during the current five-year plan because of a limitation of material resources and the inadequate capacity of construction organizations. These questions include the creation of capacity for the output of: railroad machinery, open-pit dump trucks and tandem trailer trucks of high and extremely high load capacity, means for the mechanization of elevating-and-conveying, loading-and-unloading and warehouse operations, and electric drills.

Successful solution of the tasks that the party and the government have presented to the machinebuilders, particularly for the improvement of planning, will enable a new uplift of the national economy to be provided for and the scientific and technical level of all its branches to be raised.

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EFFECTIVENESS OF PROGRAM-CONTROLLED MACHINE TOOLS ANALYZED

Moscow PLANOVOYE KHOZYAYSTVO in Russian No 1, Jan 80 pp 110-113

[Article by G. Vasil'yev and L. Zotova: "The Effectiveness of Using Machine Tools with ChPU"]

[Text] Machine tools with ChPU (numerical program control) are one of the means for intensifying and raising the effectiveness of industrial production. They enable series and even small-series production to be automated, that is, those areas which until recently were automated only with difficulty and where the share of manual operations were much higher than in large-series and mass production. Program control makes it possible to give the equipment a heavier workload. Thus, while cutting time for universal machine tools consists on the average of about 15-30 percent of overall time expenditure during the manufacture of a part, on automatic machines with program control it is increased to 50-80 percent. Because of this, productivity is sharply raised and the equipment requirement is reduced.

Machine tools with program control combine the achievements of universal and specialized automatic machine tools, which are distinguished by ease of resetting, greatly reducing the time for subsidiary operations. On the average each machine tool with program control replaces 3-5 ordinary universal machine tools, the requirement for production space and work force also being reduced by about the same amount.

The use of machine tools with program control leads in many cases to a 3-fold to 7-fold reduction in labor intensiveness in machining, and the replacement of 15-20 percent of all machine tools in machinebuilding and metalworking by them would enable the requirements for machine-tool operators to be reduced by almost 1 million.

At enterprises equipped with universal machine tools, the parts spend 95 percent of the time waiting their turn for machining, only 5 percent of the time on the machine tool. Of that time, 1 percent is spent directly on cutting, the remaining 4 percent going to fastening the part, moving the machine-tool components, and monitoring. When using machine tools with program control the time the part spends in the department can be cut

by at least one-half to two-thirds, and productive work time is increased to 50 percent.

The production of program-controlled machine tools has been developing at an accelerated pace in recent years. Thus, while only 16 of them were manufactured in 1960, 49 were made in 1965, 1,588 in 1970, then 5,532 in 1975 and 6,300 in 1977.

Program-controlled machine tools have passed through several developmental stages. Only control devices were added to first-generation machine tools, with which program control started. On second-generation machine tools, which were widely distributed, it was possible to machine parts comprehensively and to conduct multiple machine-tool servicing. These included: highly automated program-controlled machine tools with automatic change in spindle speed and high-speed feed drives; and machine tools supplied with modern program-control devices and with the program task placed on punched tape.

Designs for third-generation program-controlled machine tools call for automatic loading and unloading of the blanks and the articles being machined, automatic resetting of the machine tool in accordance with the program, and communication of the machine tool with the control system. Third generation systems, particularly those made with integrated microcircuits, have good technical characteristics.

Much work has been done in our industry in recent years to create new designs for machine tools with program control. During the Ninth Five-Year Plan more than 50 models were mastered and sent to series production.

The domestic industry is now producing highly automated lathes and milling, boring and drilling machine tools with program control. In a comparatively short time they won popularity at enterprises and were converted into one of the most important means for automated production. However, at some enterprises skilled servicing of these machines was not organized, as a result of which in some cases their technical capabilities were not used, the workload proved to be low, and operating costs for machining were higher than prior to their introduction.

This article generalizes the experience of operation of machine tools with program control at a number of machinebuilding enterprises.

The economic effectiveness of using program-controlled machine tools was analyzed for 51 parts at a number of Moscow and Tula enterprises. Labor productivity for milling work grew about 2.5-fold, for lathe work almost 1.2-fold to 2.5-fold, and for boring operations 1.3-fold to 2.7-fold. At the same time, the data analyzed showed that the machining was economically suitable for only 24 of them. This was attributed to an incorrect choice of parts to be machined.

In order to obtain high technical and economic indicators when introducing program-controlled machine tools into operation, it is necessary to

determine the mix of parts for which machining on these machine tools is desirable, namely, those which require high precision and quality of machining.

Some of the causes of inadequate effectiveness of machine tools with program control were found to be low skills of the servicing personnel, poor training of programers, and a weak workload of the enterprise's machine tools.

A substantial economic effect is being obtained in machining complicated parts on program-controlled machine tools. Thus, at the Yasnogorsk Machinebuilding Plant, machine tools with program control reduce labor intensiveness by about 20-30 percent in straight-line milling, by one-half to two-thirds when milling intricate contours, and by nine-tenths or more when machining complicated three-dimensional parts.

The enterprises' experience also indicated that it is economically advantageous to machine complicated parts with a large number of surfaces to be machined on "machining-center" type machine tools. According to the Tula plants' data, one multiple-operation machine replaces 6-7 ordinary machine tools and reduces the number of operators accordingly. The use of a program-controlled system yields an especially great economic benefit on large drilling tools and vertical turret lathes. Outlays for the control system are not relatively great in comparison with the cost of the machine tool, and labor productivity is increased severalfold. Also, the precision of parts manufacture is raised, and, consequently, also the quality of the articles. In the operation of certain types of program-controlled lathes, particularly those equipped with an adaptive control system, parts manufacturing precision doubled.

The milling machines with program control that are used at the Yasnogorsk Machinebuilding Plant enable higher precision and surface finish to be obtained. These reduce the amount of finishing work to be done by using personnel.

Machine tools with program control enable the use during parts manufacture of more rational machining regimes (a concentration of operations should be considered when choosing the mix of parts to be machined). Multiple machine-tool servicing is possible for them, enabling products to be produced with less manpower.

The period of preparation for production is reduced by 50-70 percent on program-controlled machine tools (in comparison with copy-type machine tools), the saving in the cost for the design and manufacture of the tooling is 30-80 percent, the amount of special tooling is cut in half, and rejects are cut by about 50 percent. Expenditures for accessories are cut by 50 percent, and periods for converting to a new article are reduced because of the possibility for anticipatory and centralized writing of the program. This is especially important for such industries as aircraft manufacture and shipbuilding.

Maximum workload is an important reserve for raising the utilization effectiveness of program-controlled machine tools. Even at machine-tool manufacturing enterprises, where it is easier to pass on experience in operation with program-controlled machine tools, the workload coefficient for them has not always been high. Thus, in 1976 it was 0.35 at the Vologda Machine-Tool Manufacturing Plant, 0.28 at the Zhitomir Plant for Automatic Machine Tools, 0.1 at the Baranovichi Plant for Automatic Lines and so on. Such a situation is caused by the fact that the mix of parts economically most desirable for machining on program-controlled machine tools had not been found. Timely and high-quality technological preparation for production had not been made, and the machine tools had not been supplied with highly effective tooling.

In order to service machinebuilding enterprises by region, the ministry of the machine-tool manufacturing industry is creating cluster centers. This solution can scarcely be called the most rational, because both domestic and foreign production of program-controlled machine tools must be serviced at these centers. Consequently, in no way is it possible even to speak about specialization in the work. For it is difficult in practice to concentrate in one center specialists who will know the designs of all program-controlled machine tools and the characteristics of their programs, be capable of eliminating defects, and so on. It is also impossible to establish the necessary spare-parts reserve for all machine tools being operated in the area attached to each regional center. Servicing can be carried out in the most skilled fashion only by the manufacturing plant, where the servicing centers should be created, in our opinion. The manufacturing engineers, programers, installers, setters-up, and specialists for definite types of program-controlled equipment should be gathered together there.

One of the organizational prerequisites for obtaining economic benefit from program-controlled machine tools is the creation on the basis thereof of separate sections (or departments) where conditions for the repair of equipment are improved, and the machine tools can be repaired and inspected without disturbing the industrial flow line. The increase in the number of machine tools with program control at enterprises will reduce servicing personnel manpower.

At the start of 1977 there were 177 sections at 159 plants for 2,380 machine tools with program control. By the end of the Tenth Five-Year Plan another 138 sections are to be created at enterprises. In 1978-1980, 11 automated complexes made up of program-controlled machine tools will be created.

With the introduction of computers into the control of equipment operation, a change in the structure and methods of controlling and organizing production is required, plus a rise in the skills of servicing personnel. This involves great outlays, but at the same time it yields great economic benefit. The reserve of material resources is reduced by 15-25 percent, the time spent carrying out orders is reduced by 20-30 percent, and the coefficient of the equipment's workload is increased by 5-7 percent.

The use of computers for controlling and for monitoring the work of automatic lines, in comparison with lines that operate without computers, reduces downtime because of malfunctions of the mechanical system by 45 percent and of the electrical system by 23 percent, and the time spent for preventive replacement of the tool is reduced by two-thirds to four-fifths.

The computer distributes the machining operations on the parts among the machine tools, chooses the rational machining regimes and directs the flow of parts from machine tool to machine tool along the shortest route. The computer is charged with design analysis, computation of the optimal technology and so on. Use of the computer enables a system of comprehensive automation, based upon integrated systems, to be implemented.

The first comprehensively automated sections for machining frame parts and shafts and machine tools that are controlled by computers are in operation in our country. These sections machine parts for a number of Moscow enterprises, such as the Stankokonstruktsiya and Krasnyy Proletariy plants and the Plant imeni Sergo Ordzhonikidze.

Special attention is being devoted during the current five-year plan to the forming of comprehensively automated sections and departments from such machine tools, centrally controlled by computer. About 90 enterprises of various branches of industry are working in this area under the general guidance of the Ministry of Machine Tool Building and Tool Industry under a unified program.

Systems of varying complexity are being used abroad, from computer complexes that are designed for controlling groups of up to 255 machine tools to comparatively simple systems where a group of 15 machine tools is controlled.

In the GDR an industrial system with program control by the ROTA-FS-200, which is intended for the comprehensive machining of parts, has been introduced. Eight machine tools, which comprise the system, operate in conformance with a unified program prescribed by the overall computer control. This system is composed of ordinary serially produced machine tools.

For operation of the machine tools in an automatic regime, each is equipped with a control device and is serviced by a robot loader. The latter not only feeds the blanks from an intermediate magazine to the machine tools and puts them back after machining, but it also automatically replaces the cutting tool and tooling elements.

Modern computer systems for controlling industrial equipment are being built in accordance with two schemes: centralized with one computer; or decentralized, under which the equipment's operation is controlled by various small computers, while the collection, processing and distribution of information and monitoring of machining processes are performed by the main computer.

The multiple-product LM-700 automatic line, which is made up of machine tools and is computer controlled, is in operation at the Minsk Plant for Automatic Lines. It consists of machining centers which do milling, thread-cutting boring and drilling operations. It is controlled by a computer complex based upon the M-6000 computer. The line replaces 20 general-purpose milling and boring machine tools.

Industrial robots that operate in accordance with a prescribed program have been used increasingly in recent years. They can be used to perform industrial operations (coloring, welding and so on), to automate storage and transport processes, and so on. These are "first-generation" robots: the robot can take only those loads that are in one place and put them at previously set places. Even these robots relieve man of heavy and monotonous work. They have proved themselves well during the loading and unloading of presses, casting machines and reheating furnaces and in cleaning, welding and coloring parts. And right now work is being done to create "second-generation" robots that will be able to a great extent to be discriminating independently in situations that arise. In essence, a new branch of industry--robotbuilding--is being born.

The use of robots will enable production sections to be automated. The productivity of equipment serviced by robots is doubled or tripled and the requirements for workers is sharply reduced.

The basic structural unit of automated machine tools with program control should be the "machine tool-robot" technological complex. Such a complex can include several machine tools that are serviced by one robot.

The greatest advantage of robots is that they enable not only loading and unloading work but also the main technological operations to be combined into one cycle.

Accelerating the introduction of program-controlled machine tools is inseparably linked with an improvement in price setting. Both the production of equipment and the rapid introduction thereof into the national economy depend upon the correct establishment of prices for new equipment. The prices should, on the one hand, motivate enterprises that make the machines and mechanisms to execute the most rapid creation, mastery and production of progressive equipment, and, on the other, stimulate the introduction of this equipment at the enterprises that use it.

New machine tools with program control are in most cases far costlier than the nonautomated equipment they replace; this adversely affects the effectiveness of their introduction into production. For example, the price for a program-controlled 16K20F305 machine tool, which Moscow's Krasnyy Proletariat plant produces, costs 10 times as much as the basic universal 16K20 machine tool. The 2A622 F2-1 drilling machine of the Leningrad Association imeni Ya. M. Sverdlov with the numerical program control of the Tomsk Plant for Mathematical Machinery costs twice as much as the basic machine. Such examples in the industry are more than adequate.

One of the causes of the high prices for program-controlled machine tools is an obsolete practice of setting the prices. For example, prices for new machine tools are set in many cases not as a function of their productivity or other technical or economic advantage but are based upon the weight and the extent of series production or the actual outlays for their manufacture.

The main reason for the high cost of machine tools with program control is as follows.

In the first place, program-controlled machine tools are manufactured not in mass production or large-series production but singly or in small series. In this case a long time is taken to design and master them, leading to great expense, which increases their cost.

In the second place, standardization and unification of components and parts of program-controlled machine tools have not been widely developed.

In the third place, the high cost of program-controlled systems leads to increased costs for the automatic equipment as a whole.

The high cost of machine tools with program control is a serious factor that holds back their wide introduction into production. The development of automation on the basis of program-controlled machine tools requires the development of a unified system of measures for reducing the costs of the automating equipment.

The process of reducing prices for program-controlled machine tools, which has been reflected favorably in the effectiveness of their use at enterprises, has started to be implemented recently.

Thus the economic effectiveness of machine tools with program control is being provided through technical, organizational and economic factors, in the process of both their production and operation, and is being supported by the joint efforts of planning organs, scientific-research institutes, the SKB's [special design offices] that are engaged in their design, and the manufacturing enterprises and plants where these machine tools are being operated.

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